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Technical Editor: C. O. BRETTELLE, M.I.E.E. *Joint Managing Director:* E. A. GATEHOUSE, M.I.E.E., A.M.INST.C.E. *Commercial Editor:* A. H. BRIDGE.

Manager and Secretary: E. S. MIDDLETON.

OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

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Railway Operation.

IN this issue we publish an article giving some leading particulars of the electrification of the railway from Manchester to Altrincham, now being carried out by the L.M. & S. Railway. The scheme includes several features of particular interest, among which are the first use of distant-repeater control of an unattended sub-station and of a 1,500-volt mercury-arc rectifier. At that voltage the rectifier promises to be a serious competitor of the rotary convertor on the ground of efficiency; at lower voltages, except at light loads, advantage in this respect lies at present with the rotary convertor. It was stated, however, at the meeting of the London Students' Section of the I.E.E. reported by us last week that the time taken in re-starting a sub-station equipped with this type of apparatus after a shut-down was materially reduced, and if extended experience substantiates this claim it may well prove more important than any question of energy losses.

The highly satisfactory results obtained by electrification on the Southern Railway were especially noted in the report of the Royal Commission on Transport, a review of which is concluded in the present issue. The record of the L.M. & S. Railway is, as we show in the article on the Altrincham scheme, second only to that of the Southern Railway, and it may be worth while considering how far the organisation of the companies concerned may affect progress in electrification.

In a paper entitled "The Economic Operation of Electrified Railways," presented by MESSRS. C. H. MERZ and F. LYDALL before the World Power Conference last summer, the methods of obtaining the most economical results in organisation of the supervising staff and in maintenance of equipment were discussed in considerable detail. The type of railway dealt with was one in which a new organisation would be required for a railway already fully staffed for steam operation, involving considerations not present with lines designed from the beginning for electric working. The authors suggested that the new organisation should be based upon the operating rather than upon the technical side of that previously existing. This appears to us to be certainly the most practicable method, but it involves certain adjustments of responsibility that are likely to introduce difficulties in some cases unless a definite step be taken

to create a new department freed from the shackles of tradition.

We have referred to the progress in electrification made by two British railways. Turning to the appendix of the paper under mention, we find that in each case the chief electrical engineer is directly responsible to the general manager of the line, an arrangement which not only concedes the principle that electricity is not regarded as a mere auxiliary to steam, but one which should allow considerably more flexibility when choosing the most suitable means of locomotion in any particular set of circumstances.

The Domestic Electrification Campaign.

WHEN there is some danger of the pessimism current in other industries infecting the "fairly prosperous" electrical industry, what are the economic chances or possibilities of the second section of Eda's Electric Homes Campaign? With this very practical question before him, MR. V. W. DALE, Business Manager of the Electrical Development Association, opened the discussion at last Friday's Sales Conference. To what extent is the public financially able to respond to the efforts to boom domestic electrification? Mentioning such interesting facts as the ability of hundreds of thousands of people to enter into relationships essential to the promotion of connubial bliss; the fact that thrift is coming into favour again; that motor-cars are ever-increasing in popularity; that the demand for tobacco and liquid refreshment continues, while wireless and even dog licences are renewed, the speaker held his contention to prove that bad times were no excuse for expecting a falling-off in the setting-up of new electric homes. Indeed, the actual conditions were such as to lead the public to divert from certain other directions some part of their available cash for increasing and improving the amenities of the home. Which suggestion means, of course, a bigger demand for electricity and for domestic electrical apparatus. We report Mr. Dale's valuable contribution elsewhere. It contains much useful information.

We thoroughly believe in the campaign. Whatever we may think of the ability or inability of certain sections of the community to go in for complete installations, we must not shut our eyes to the facts that the country is still very largely unelectrified, that the merits of electricity are beyond dispute, and hundreds of thousands of people are in a position to electrify new homes or to add new points to existing installations. Strong co-operative action on the part of the industry is bound to produce great results by bringing pressure to bear upon the public immediately. Manufacturers who have large supplies of fires, domestic cooking and other appliances, should be forcefully bringing these before contractors and other trade buyers just now in their advertisements. All the time is buying time for things electrical—points can be advanced for every season of the year for carrying out domestic electrification.

Power Station Efficiencies.

IT is, and has been for some years, a constant cry of the critics that the capital costs involved in aiming at higher efficiencies for power-station equipment are too high, or that the increases in efficiency obtainable are too low to justify the capital expenditure. On the surface the criticism in many cases appears to be sound, but consideration of two very practical points presents a somewhat different picture. Once a certain efficiency increase is assured, no matter how small or large, it is only a matter of mathematical calculation to prove whether or not the expense involved is justified, or whether the balance sheet is sound. Further, the results of the efforts of those out for efficiency improvement over a period of time are cumulative.

The records given by MR. PERCY E. RYCROFT in the paper on "Power Station Efficiencies" which he presented before the Institution of Engineering Inspection, and of which we publish an abstract elsewhere in this issue, serve a very useful purpose in presenting the cumulative effect of efficiency increases so clearly. No one, least of all those whose confidence is a trifle shaken at the prospect of only a fractional increase at one time, will suggest for a moment that the increase in maximum efficiency of power stations in this country during the period 1921 to 1930 of from 17.75 to 24.36 per cent. has not been worth while, particularly as the increase has been accompanied by a fuel consumption (lowest) decrease of from 1.93 to 1.18 lb. per kWh generated.

In the discussion on Mr. Rycroft's paper comments were made on the old question of the heat rejected into the condenser circulating water. As to why large amounts of money should be spent in improvement within the present limited practical field of efficiency increase when so much more is theoretically possible in the "unexplored" field, the answer has already been partially given in this note; whereas efficiency increases within the present practical limits can be balanced against expenditure, progress in the unexplored field is at present only a matter for research.

We do not wish to minimise the importance of the question of heat wastage, and we whole-heartedly support any movement which aims at a fuller usage of the heat released in the combustion of fuel. The problem is largely bound up with that of fuel economy, in which connection the Institute of Fuel is doing such important work. It is encouraging to see the support given to the Institute by the electrical industry, but fuel economy must always be of the greatest importance to the industry in this country, and we hope, therefore, that the support will be adequate.

Foreign Electrical Trade in 1930.

THE statistics of this country's electrical exports and imports during 1930 which we publish in this issue are of a mixed character. That is, they can be viewed with satisfaction or dissatisfaction according to the reader's state of mind. On the whole, we think that, having full regard to the abnormal and adverse conditions prevailing last year, the figures can be regarded as satisfactory. So far as exports were concerned, if we did not make much progress we kept up to the level of 1929, while the United States, for instance, had to record a considerable falling-off in its electrical exports. In the supply of electrical machinery we were able to make appreciable headway in such difficult markets as Canada, Europe, and South America, although India and Australia proved disappointing. As we state in our article, it is practically impossible to assess the effect of declining prices upon our foreign trade figures. But it was shown in our issue of January 9th that the prices of three of the leading raw materials used in the electrical industry had fallen considerably during the past year; in the case of electrolytic copper, the difference between the year's opening and closing prices was about 38 per cent., while English pig lead fell by 28 per cent. and rubber by a similar amount.

It is unfortunately true that, although this decline in prices must have also affected imported goods, the total value of those goods was about £437,000 higher than in 1929. That was, however, counterbalanced to a great extent by a rise of £296,000 in the value of re-exported products. The increase in the import total was due almost solely to the rise in the item "meters and instruments," for which an influx of talking-picture apparatus is believed to be largely responsible. The possibility of foreign electricity meters having to be marked in the near future may also have had something to do with the increase in this item.

The general conclusion to be drawn from the figures is that, while we are still importing a large amount of electrical material which could be produced at home, we are still maintaining a good hold upon external markets.

High-voltage Surges.

To many of our readers the effect of surges and steep-fronted travelling waves on the windings of a transformer possesses an element of mystery. These will find the clear non-mathematical exposition given by MR. E. T. NORRIS in his article on "Transformer Design" of value as giving an insight into some of the problems involved in this branch of electrical engineering. It is not always appreciated that the stresses on the end turns cannot be rendered innocuous merely by reinforcing the insulation. Improvement in voltage distribution must be ensured by increasing the relative capacity between turns and by obtaining a suitable dielectric flux distribution.

Assisted Wiring and Hire-Purchase.

A FEW months ago (ELEC. REV., August 8th, p. 236) we reviewed the reports of the Electricity Commissioners' Committees on Tariff Uniformity and on Assisted Wiring and the Hiring and Hire-Purchase of Electrical Apparatus. The Commissioners have now sent us a statement of their views upon the latter report.

In this they give general approval to the report and express their intention of acting upon a number of specific recommendations made by the Committee. They agree that those undertakings which have not yet instituted assisted-wiring and hire or hire-purchase schemes should give immediate consideration to the matter, with a view to formulating schemes suitable for the requirements of existing and potential consumers in their respective areas. The Commissioners further recommend these undertakings to study the specimen financing schemes which the Committee appended to its report. They intend to communicate with all undertakers who have not yet instituted schemes, urging the matter upon their attention and inquiring as to any difficulties which may stand in their way.

The Commissioners also announce their intention of calling for particulars from electricity undertakers of the steps which they have taken in the matter, and this information will be embodied in the Commissioners' annual reports.

It seems incredible, but it is unfortunately true, that such steps should be necessary. Any supply authority which is not entirely shut off from the outer world must have heard of the remarkable success which has attended the institution of assisted-wiring and hire-purchase arrangements in towns of widely-varying types and sizes. Yet, according to the Committee, out of 614 undertakers actually giving supplies 230 had not instituted either kind of scheme. Only 187 were running both assisted-wiring and hire-purchase schemes; 213 had assisted-wiring schemes only; and 304 provided hire and/or hire-purchase facilities.

Many undertakings which had no schemes informed the Committee that there was no demand for facilities, while others said that they were waiting for a lead from other authorised undertakers. The attitude of the first group is, of course, just the one that we are constantly endeavouring to alter. The answer is summed up in the oft-used phrase, "Electricity will not sell itself." There *is* a demand, or an aspiration, for electricity, but it is largely an inarticulate demand, and the methods of some electricity undertakers are not such as to encourage approach. In fact, in their case the unfortunate term "undertaker" with its associations of rigid formality and slow progression, is not ill-applied. These authorities must be persuaded to abandon the idea that they are casting their electrical pearls before swine, and instead be urged to cast their bread upon the waters with the practical certainty of returns after not many days.

It is to be hoped that the Commissioners' further efforts (of which MR. MORRISON'S "campaign," referred to last week, seems to be the first phase) will bring definite results.

Four News Items.

THERE were in our last week's issue four news items that deserve to be brought into closer relationship. The first was the official statement of the Electricity Commissioners regarding electricity generated by authorised undertakings in 1930 (the issue of this information within ten days of the end of the year to which it relates is, by the way, commendably prompt.) The output was only 5.6 per cent. more than in 1929, instead of the 10 per cent. or so which we have come to anticipate as the annual rate of growth. This is, of course, disappointing but that it might well have been worse, having regard to the state of trade, is obvious from the information we have received from Germany. The output of the 122 principal undertakings up to the end of October last showed, not merely a slowing down, but an absolute reduction of over 2½ per cent. from the previous year's total at that date. In our report this decline in output was attributed to industrial depression. The same absolute reduction has, we understand, been experienced in the United States. Industrial depression was also responsible for a falling-off of more than 10 per cent. in the sales of electricity in the Rochdale area compared with the previous year. What this means may be gauged from the fact that it is the first set-back of the kind suffered by the undertaking since its establishment 32 years ago. Here the situation would have been even worse but for increased consumption for domestic purposes, which is encouraged by the low secondary charge of the two-part tariff, *viz.*, 0.5d. per kWh, and by the hire, hire-purchase, and assisted wiring schemes in force.

Our fourth item relates to Watford, where MR. A. W. BARHAM has reduced the secondary charge of his two-part tariff to 0.375d. per kWh in the summer quarters.

The conclusions, to be drawn from the aggregation of these four instances will, we think, be apparent.

Qualifications of Works Electricians.

THE frequency of prosecutions under the Factory Acts is a constant reminder that the need for the employment of properly-qualified men in large industrial works is still far from being realised by the managements responsible. A case reported by us this week of a breach of Home Office regulations appears, from the information available, to present a particularly flagrant example of irresponsibility towards the safety of workers. The use of a circuit breaker in the neutral wire of an installation is not only a breach of the regulations, but also a crime against engineering sense. It is dangerous in house wiring, but far more so in a shipyard.

The Home Office Regulations, with MR. SCOTT RAM'S detailed commentaries, are so clearly expressed that there should be no excuse for ignorance of their requirements on the part of any one qualified to plan an electrical installation. Even if the regulations were less lucid, a properly-skilled man should, in the present case at least, be capable, by the exercise of trained judgment, of seeing the danger of the practice condemned. The maximum penalty was inflicted on the employers.

The Meter and Instrument Section.

LAST week, in commenting upon the Physical Society's Exhibition, we referred to the value of the papers read before the Meter and Instrument Section of the I.E.E. Since then, the I.E.E. has issued a circular which seems to imply that the section is not receiving the support it merits and requires. It should be emphasised that the section is not only concerned with energy meters, but that instruments of every kind, including protective devices, fall within its field. Though the membership of the section is said to be steadily increasing, the interest shown in its operations, judged numerically, is not so pronounced as its importance warrants, since measurement and protection were never of such moment or of such intricacy as they are now.

The Altrincham Electrification.

Some particulars of the sub-station and track equipment of the railway between Manchester and Altrincham now in course of conversion to electrical operation.

THE railway connecting Altrincham (Ches.) with Manchester (London Road) will, it is anticipated, be opened as an electrified line in the course of the next three or four months. The population of Altrincham at the last census was only a little over 20,000, but it has recently grown rapidly, and the development of the Manchester Corporation housing estate in the immediate vicinity will provide a further material increase in the number of inhabitants so as to warrant a five-minute service during rush hours. The trains will be multiple-unit with compartment-type coaching stock. Each train will have accommodation for 536 passengers. The route length of the line is a little under nine miles, comprising about 27 miles of single track. It will link up with the suggested comprehensive scheme which, when complete, will allow for track connection of underground lines in Manchester with suburban sections of existing main-line railways at several points. The Altrincham line is owned jointly by the London, Midland and Scottish and the London & North-Eastern Railways, and the work of electrification is being carried out by the former. Both companies were among the pioneers of electrification in Great Britain; in the system of the L.M. & S. is included the Liverpool-Southport line, put into service in 1903, one year earlier than the Tynside scheme of the L. & N.E.R. Since that time the L.M. & S. Railway has made considerable progress in this connection and now owns 108 miles of electrified track (20 per cent. of the total for the whole country) including 225 single-track running lines and 26 miles of sidings. The energy sent out last year from its sub-stations for traction amounted to some 114 million kWh. The L.M. & S. electrified railway is now second only in size to the Southern Railway, which is the most extensive above-ground system within the Empire.*

The recommendations of the Ministry of Transport Railway Electrification Committee (1927) have been followed in adopting the 1,500-V d.c. system for the Altrincham scheme. With the exception of the 32-mile

Fig. 1.—Brush Bracket with Pressure Plungers Raised.

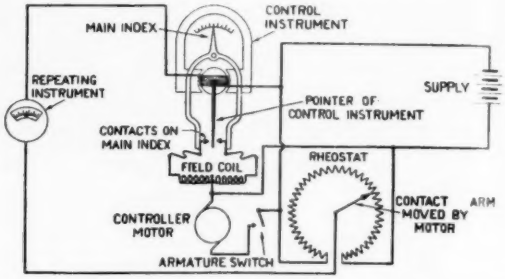


Fig. 2.—Connections of Midworth Distant Repeater.

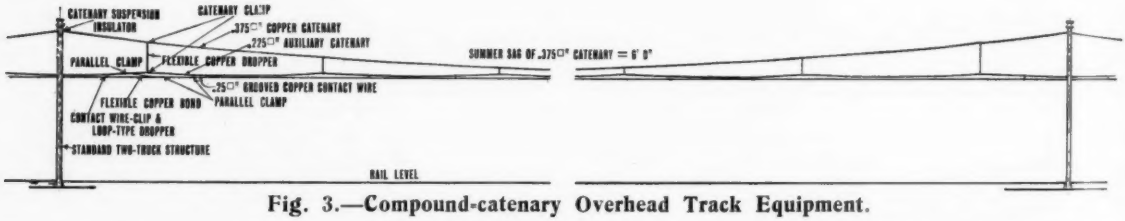


Fig. 3.—Compound-catenary Overhead Track Equipment.

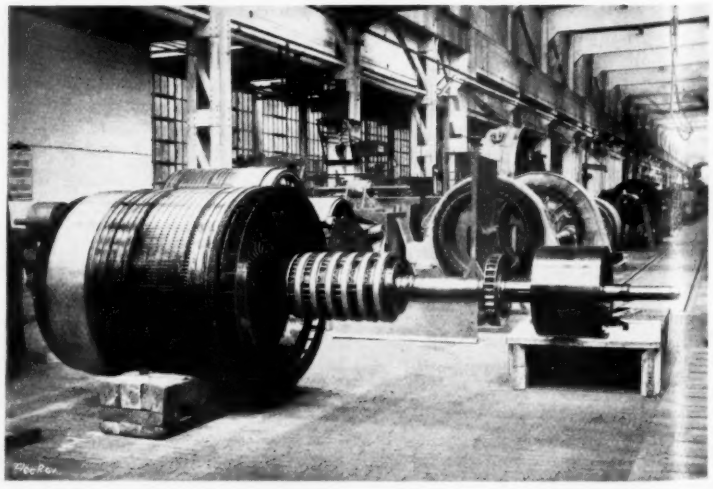


Fig. 4.—Armature of a 1,500-kW Traction Rotary Convertor.

* R. T. Smith, "Railway Electrification," ELECTRICAL REVIEW, June 20th, 1930, and C. H. Merz and F. Lydall, "Economic Operation of Electrified Railways," second World Power Conference, 1930.

(route length) mineral traffic line of the L. & N.E.R. running since 1915 between Shildon and Newport, it will, however, be the only line yet operated at that voltage in Great Britain.

Electrical energy will be purchased from the Stretford

Fig. 5.—Erection of 75 ft.-span Girder.

Electricity Board at 11 kV, 50 cycles, and will be transmitted to two sub-stations equipped by the British Thomson-Houston Co., Ltd., where it will be converted to 1,500 V d.c. One of these, situated at Old Trafford, will be manually operated; the other at Timperley, five miles distant, will be remotely controlled from Old Trafford. The manually-operated sub-station will contain two 1,500-kW units, each consisting of two 750-kW, 750-V rotary convertors connected in series and supplied by a common 1,650-kVA transformer having a separate secondary winding for each machine, and one 1,500-kW mercury-arc rectifier. The remotely-controlled sub-station will contain three 1,500-kW rotary-convertor units similar to those at Old Trafford. The commutators will have the same diameter as the armatures (see fig. 4), the armature bars being directly connected to the commutator segments without lugs, with a view to preventing fumes caused by short-circuits from finding their way to the back of the commutator; dispersal of vapours is also helped by a fan on the armature. The brushgear, fig. 1, is being so designed that the current passing between the brushes and the bus rings will produce a strong magnetic field at the brush box, with a view to the rapid removal of current-carrying vapour from the commutator face.

In the remotely-controlled sub-station will be automatic devices for shutting down a machine if the windings become over-heated or develop a fault to frame, or if any of the bearings exceed a certain temperature. The protective relay in the first of the three cases is being designed to have the same heating and cooling characteristics as the machine, and to allow of automatic restarting when the temperature of the windings has fallen to normal. All d.c. breakers will be of the high-speed type, those in the machine circuits being arranged for reverse-current operation only.

The attendant at the Old Trafford sub-station will control the rotaries at Timperley by apparatus of the Midworth type, the connections of which are illustrated in figs. 2 and 6. Incidentally, this will be the first occasion on which such gear has been applied to the control of power plant. The attendant at the controlling sub-station will receive at all times continuous indication of the bus-bar voltage and the load on each unit; he will be able to start of stop any machine, vary its field rheostat, and close or open any of the machine or track circuit-breakers.

The Midworth distant repeater consists, in effect, of a number of moving-coil instruments, those used as transmitters being provided with contacts controlling a small potentiometer rheostat which is motor-operated from a 110-V battery. Each transmitter comprises a main index which is moved over its scale, either mechanically or by the meter movement whose indications are to be transmitted to a distance, and carries two contacts—one for each direction of rotation of the rheostat motor. The pointer of the control instrument floats between the contacts of the main index, any movement of which will cause one of its contacts to touch the pointer of the control instrument and will carry the pointer to a new position.

It will be seen from fig. 2 that the value of the current flowing through the coil of the control instrument is dependent upon the position of the rheostat arm; so long as the control instrument pointer is in contact with the main index, the rheostat motor will revolve and cause this current to vary in value. The rheostat arm will, therefore, continue to move until the current

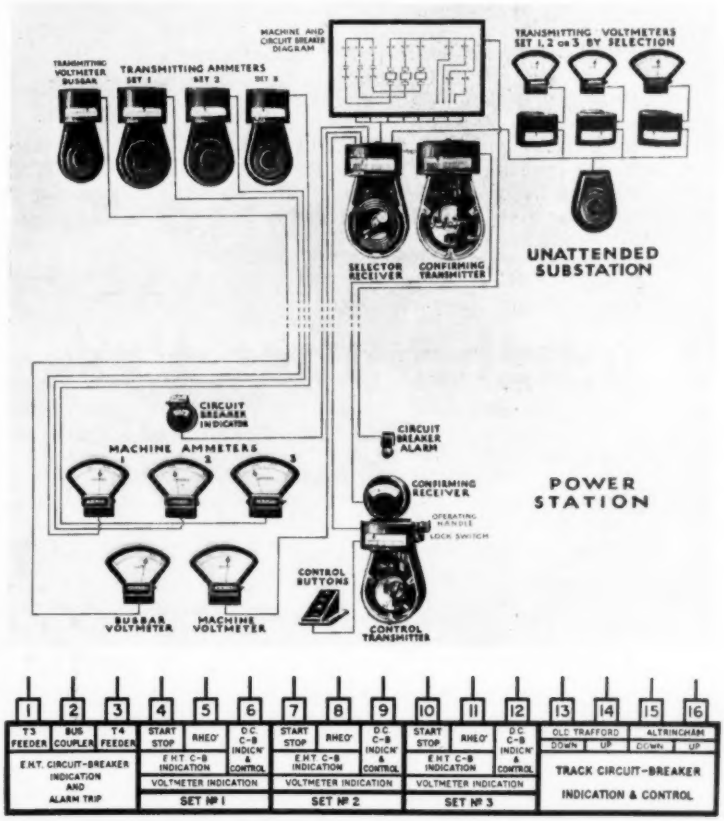


Fig. 6.—General Arrangement of Sub-station Control System.

reaches a value at which the free-floating position of the control-instrument pointer coincides with the position to which it has been carried by the main index. When this condition obtains, the contact between the control instrument pointer and the main index is broken; the

rheostat motor then stops and the apparatus is once more in a state of equilibrium. It will be evident, therefore, that for every position of the main index of the transmitter there is, when equilibrium is reached, a corresponding current flowing in the control instrument coil. This coil is in series with the coil of the repeating instrument at the receiving end, and, therefore, the pointer of the latter instrument will take up the same relative position as the main index. By means of this arrangement the reading on any meter at Timperley can be accurately repeated at Old Trafford.

For the control of the plant at Timperley a transmitter having a mechanically-operated main index will be installed at Old Trafford. This index will be moved by the operator over a scale on which the usual graduations are replaced by divisions, each bearing the name of an operation that it is desired to perform, while the corresponding repeating instrument will take the form of a dial-type switch, each contact of which is connected to the appropriate apparatus. Mechanically coupled to this dial switch is a second transmitter, the function of which is to indicate its position to the operator at the control end. Thus, to close any particular switch at Timperley the operator at Old Trafford will move his main index to the required position. The resultant movement of the dial switch at the distant station will be repeated on his indicator, and, when he sees that the desired contact has been selected, he closes a control switch and the selected operation is thereby carried out. Further arrangements are made whereby an indication is automatically given to the operator that such operation has been performed.

Each sub-station will be provided with cleaning plant, consisting of a motor-driven turbo-blower and vacuum cleaner, with permanent connections to points alongside each machine. This plant will be fed from a 25-kVA transformer, which will also supply the lighting, heating, and other auxiliary services.

The 1,500-V d.c. overhead installation, which is being carried out by Messrs. Callender's Cable & Construction Co., Ltd., also presents many features of interest. A compound catenary with suspension insulators is used, as shown in fig. 3; the normal height of the contact wire will be 16 ft. above rail level and the span between supports on straight track will be 220 ft.

Fig. 5 shows a girder of 75 ft. span in the course of erection; fig. 7 a typical run of two-track structures; and fig. 8 some four-track structures where there is room to use a centre support.

Our thanks are due to Lieut.-Col. F. A. Cortez Leigh, M.I.E.E., L.M. & S. Railway, Euston Station, for confirmation of information supplied by the contractors in connection with the preparation of this article.

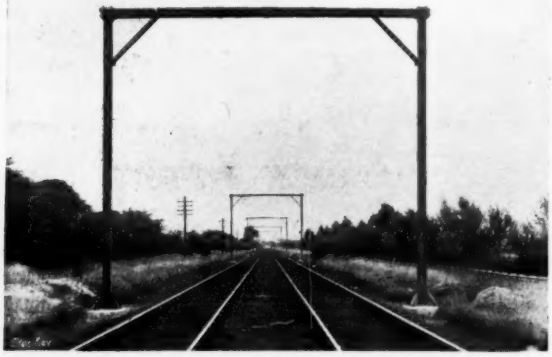


Fig. 7.—Typical Two-track Structures.

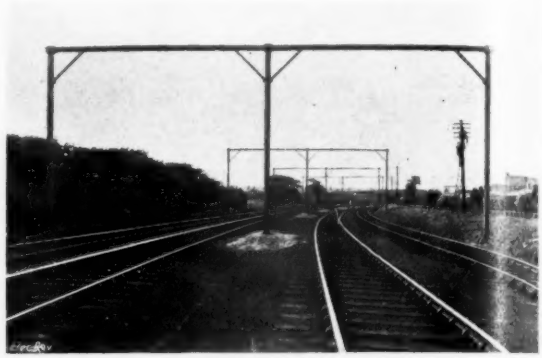


Fig. 8.—Four-track Structures.

Thoughts that Pass in the Night.

Some Recollections of a Sub-station Attendant.

By HUGH ROBERTS.

A CONTEMPORARY has been asking recently "What is a Sub-station?" Soon we can imagine this paraphrastic journal asking "What *was* a Sub-station Attendant?" For slowly there is passing from our midst a race of mute, inglorious Miltons. One by one, into the limbo of industrial change they go, these sub-station attendants, the unwanted children of the supply industry. Slowly, under the insidious attacks of a.c. change-overs their rotaries are becoming silent and the red-hot resistance-grids, where previously they cooked a matutinal kipper, are now cold from lack of load. In a dynamic world their plant is becoming static, and over pylons designed to harmonise with rural charms they see the sinuous tentacles of the C.E.B. reaching out to snatch them into its capacious maw.

Out of the night that covers them, black as the pit from pole to pole, one might almost say from pylon to pylon, nebulous shades of the past arise and crowd thickly upon them. They see themselves, flushed with the enthusiasm of youth, being told by a fatherly and optimistic station "super" that the jumping-off place to success in the supply industry was from the platform of a sub-station switchboard. Childlike in their innocence they believed him, only to find that after years of laborious travel they were still wearily resting on the bedplate of a rotary convertor, wondering whether it would not have been better for them to have opened an all-electric fried-fish shop in the suburbs, a hitherto unexplored field in the realms of electrical application. They see themselves discussing such complicated topics as *Der Nutzglimmer-Natur, Vorkommen, Gewinnung, und Verwendung*, only to find that all they needed to argue about was the relative values of beeswax and boot-polish as a medium for polishing switchboard panels.

A Man of Parts.

Let it not be thought, however, while reading this jeremiad, that the life of a sub-station attendant lacks

colour. He is a man who, in his time, plays many parts. In many undertakings he combines effectively in one protean whole the duties of shift engineer, commissionaire, mains assistant, night watchman, consumers' engineer, and greaser. But his acts occur behind the scenes of the supply drama, and it is only when he inadvertently gets stuck across some 6-kV bars that the limelight is thrown upon him.

The pageant of his life is unfolded in some queer places. Sub-station sites are chosen more for utility than for the sake of picturesque surroundings. The worst of such sites is surely one in South Wales, which adjoins the private grounds of a mental hospital on the one side, while on the other, and almost reaching to its door, is a graveyard. To do a lonely night shift here, when the wind moans mournfully through the creaking trees, and the cry of a lonely owl wails like a lost soul among the tombs, a man must have a firm hold on his imagination. It is even rumoured that the supply of inmates to the lunatic asylum is partly provided from sub-station attendants of this lonely outpost who have allowed their imaginations to run riot.

Where is Poor Yorick's Skull?

It was here that Bill Jones, a mainsman who had seen life in its vilest aspects, tried to unravel the knot of human life and fate. Set with a gang to lay a cable through the oldest part of the graveyard where almost all surface traces of the graves had been obliterated, Bill would come trotting into the sub-station with a human skull in his hands and would ask for a pathological investigation to determine the age and sex of the trunk to which it had belonged. During the process of laying the cable, so many of the narrow cells wherein the rude forefathers of the hamlet lay were broken into, that all the disturbed bones were gathered together and placed in one grave. Standing over this grave and gazing pathetically at the jumbled skeletons beneath him, Bill unburdened his soul of the spiritual problem that was worrying him. "'Ow," asked Bill of his mate, "are them there lads going to sort 'emselves out when it's time for 'em to resurrect?" and there ensued a theological argument that would have brought a smile to the face of an Inge.

"A Fiend Doth Close Behind Him Tread"!

It was here, too, that a timid attendant thought that his last hour had come. He had but newly taken over the job. Alone, one night shift, he was awakened from a doze by hearing a whimpering sound coming from the direction of some lockers that stood in a dimly-lighted corner of the station. Nervously he was about to go downstairs to investigate when suddenly a hideous face shot up over the top of the lockers and gibbered at him. He stayed to investigate no further but fled into the night, while behind him, lending wings to his feet, arose screams and violent thumpings. Two hundred yards up the road he was pulled up by a uniformed man who, he found, was a warder from the asylum searching for an escaped patient. Reluctantly and shamefacedly the attendant returned with the warder to the sub. There they found the unfortunate patient clad in his pyjamas busily and cheerfully employed, harmlessly drawing childish pictures on the switchboard log sheet. This log sheet is now framed and hangs on the sub. wall, looking like some masterpiece of Cubist art. Underneath it is printed in a startling red some trenchant advice on keeping doors locked after dark.

"The Customer is Always Right."

All subs., however, do not provide such lively incidents as these. In many instances the monotony of being on an eight-hour shift with himself drives the attendant to adopt many devices to relieve the tedium of his existence. It will be easily understood that such devices come naturally to one who, with two pins and a blob of sealing wax is ingenious enough to keep an undeviating line on a recording voltmeter chart.

In some subs., choleric consumers who complain bitterly of faulty fuses, lights and installations are the only persons with whom he converses during his long shift. Experience has taught him that tact is a vital part of his equipment to deal with these misanthropes, but at times his long-suffering temper overcomes his discretion with the disastrous consequence that he lands himself in the soup with his chief. A particularly venomous member of the disgruntled consumer family had 'phoned a sub-station attendant late one night and, in a voice perfectly capable of calling the cattle home across the sands o'Dee, had launched a vitriolic tirade against the inefficiency of the company. Patiently the attendant had listened to yards of it until the consumer had ended up with, "I want to know what the hell's wrong with my lights!" In dulcet tones the attendant replied that it was his considered opinion that it was not so much the consumer's lights as his liver that was out of order. The upshot of it all was that the chief received a letter complaining of his staff's incivility. The harassed attendant was hauled up on the carpet, given a severe wigging, and invited to be a little less Hudibrastic when dealing with consumers' complaints.

Faults on Both Sides.

The bane of the sub-station attendant's life is, however, the Mains Department. Kipling might, with equal force, have said "O! subs. is subs. and mains is mains and never the twain shall meet." Heaven, to the sub-station attendant, is a place where mains assistants are not. His formula for happiness is expressed in terms of mains assistants. Joy, to him, varies directly as their distance and inversely as their number. They upset the Ohm's Law of his life, freezing up the genial current of his soul and inserting resistance in its path wherever possible. The reason for this inherent hatred is not far to seek. The attendant has the power of interrupting the sleep that knits the ravelled sleeve of the mains man's many cares. The mains man knows this to his cost and takes every opportunity of retaliating on the attendant. The attendant's one method of revenge for any fancied grievance is to conjure up an imaginary earth leak in the dead of night and then to ring up the erring mains assistant to tell him all about it. Nothing gives him greater pleasure, on a night similar to that upon which good King Wenceslas looked out, than to see a mains assistant setting off with a frame aerial, a buzzer and a pair of headphones to search for an elusive fault. Incidentally, there is a village in the Midlands which is fully convinced, after seeing a mains assistant dashing bloodhound-like along the road with a pair of headphones clapped to his ears and a large navvy bearing his frame aerial before him, that the unfortunate man was a B.B.C. official searching for oscillators.

"Love's Labour's Lost."

It was a mains man who nipped Oxo's romance in the bud. "Oxo" was a sub-station attendant who had fallen a victim to Cupid's dart. So severely had the arrow pierced his heart that he found it necessary to find some means of communication with the moon of his delight while they were absent one from the other. Fortunately, the lady lived in a district which was fed from a radial dead-end feeder that had not at that time been connected to the main ring. Faithfully "Oxo" would draw this feeder switch two or three times in succession at a time when he thought his lady-love would be preparing herself for slumber, and the thought of this link between them brought healing balm to his lovesick soul. He even went so far as to adopt a patent morse code of his own invention whereby he could hold a brief and one-sided conversation with the lady of his dreams, regardless of the comfort of other consumers in the district who, during the periods of "Oxo's" spasms, had to make shift with a light averaging some two cycles a second. The game was too good to last. Unknown to "Oxo," complaints came rolling in. The Mains Department was at a loss to account for the phenomenon. Theories were put forward, the most tenable of these being that the flickers were caused by heavy cars passing along the road above a faulty joint or something in the cable. Holes were dug and the chief raised Cain with the mains "super," a long stringy man who suffered from boils and

was known to his subordinates as Hackenschmidt. But one night a prowling mains assistant saw "Oxo" acting rather peculiarly on the switchboard. Hiding behind a transformer, he saw "Oxo," after a cautious look round to see that there was no one about, doing his S.O.S. stuff on the feeder switch. The problem was solved and "Oxo" was forced to seek a fairer clime where his flashing of sweet nothings would entail less discomfort to the community in general. Peculiarly enough, the mains assistant who caught "Oxo" in the act of wishing his beloved good-night is now married to that same lady whose erstwhile lover communicated with her by means of a 0.5 cable with a hundred amperes on it.

L'Envoi.

But let not ambition mock their useful toil, their homely joys and destiny obscure. They have given the supply industry of their best. Alone have they fought the demon of overloaded plant. They have seen ammeter needles go hard over and stay there for hours on end while feeder fuses have grown red hot. With thumping hearts, they have watched commutators glowing like Catherine wheels and have wondered when that last amp. that would break the rotary's back was coming. With the stink of sizzling insulation in their nostrils they have fought the peak-load devil and by dint of much brain and greater daring have triumphed. Are such men as these to be sacrificed in the merciless furnace of the Moloch of Rationalisation? Are they to be cast aside and buried under the scrap-heap of inefficient plant thrown out of non-selected stations? Or can the industry find a niche for them in that brighter future for which we all hope? Time and optimism alone can tell. In the meantime they are groping blindly in a night of uncertainty and the thoughts that pass in *that* night will not bear printing.

Transformer Design—I.

An investigation into methods of reducing the stresses in windings resulting from high-voltage surges and steep-fronted travelling waves.

By E. T. NORRIS, M.I.E.E., Fellow A.I.E.E.*

IT is well known that high-voltage surges and travelling waves arising on a transmission line through lightning or other disturbances may set up serious stresses in transformer windings. A report recently published by the United States Bureau of Standards shows that, out of nearly 4,000 breakdowns of station apparatus investigated, 86 per cent. occurred in inductive apparatus, such as transformers.

Considering first an ordinary transformer winding designed without special regard to surge stresses, an incoming surge is not distributed uniformly across the winding, but concentrates in various places, particularly on the end turns. The stresses thus set up are not covered by the ordinary standard pressure tests given to the transformer on completion. As soon as the existence of these stresses was realised, an obvious solution was to reinforce the winding insulation at the places where these stresses occurred.

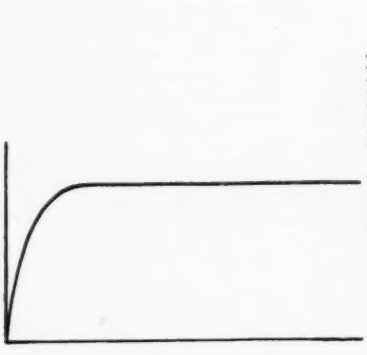


Fig. 1.—Steep-fronted Surge of Infinite Length.

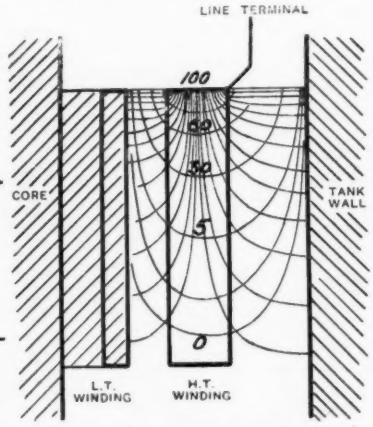


Fig. 2.—Dielectric Field of Surge Entering Winding.

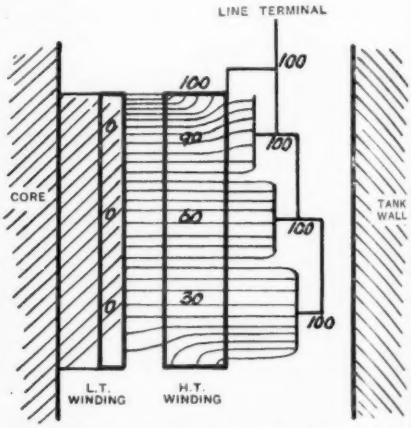


Fig. 3.—Dielectric Field of Non-resonating Surge.

The numbers represent potential distribution throughout the winding corresponding to incoming surges of 100.

Initial Distribution of Surges.

Further studies of the problem showed that a surge entering a transformer winding is initially distributed throughout the winding in accordance with the various capacity values between coils and turns, &c. The inductance of the winding has no effect on the initial distribution of the surge voltage, since the magnetic field requires time to build up. In the initial state, and when the surge has arrived on the first turn of the winding, the total capacity consists of the capacity between the first turn and the adjacent turns, in series with the equivalent capacity of the remainder of the winding. The former capacity is comparatively small, so that the voltage between this first turn and the adjacent turns is large. The same condition applies in a less degree to the remaining turns, and is the reason for the reinforcement of end-turn insulation common in high-voltage power transformers.

As the insulation between the end turns is increased, the capacity between the turns is decreased so that the concentration of the surge voltage between these turns becomes greater. Increasing the insulation, therefore, whilst effective up to a point, tends to defeat its object Moreover, increasing the thickness of insulation between turns does not increase the dielectric strength in the same proportion, so that in the limit the reduction of capacity due to the increased insulation will more than balance the increase of dielectric strength. There are,

* Chief Designer, Ferranti, Ltd.

then, definite limits to the security which can be obtained merely by reinforcing the end turn insulation. The initial distribution of the surge will be somewhat as shown in curve A of fig. 4, which indicates the voltage to ground in a transformer with solidly grounded neutral.

Results of Voltage Oscillation.

Assuming that the surge has a steep wave front and an infinite wave length, as shown in fig. 1, the final distribution will depend entirely upon the inductance and resistance relations in the winding, and, since these are usually symmetrical, the final distribution will be uniform as shown in curve B of fig. 4.

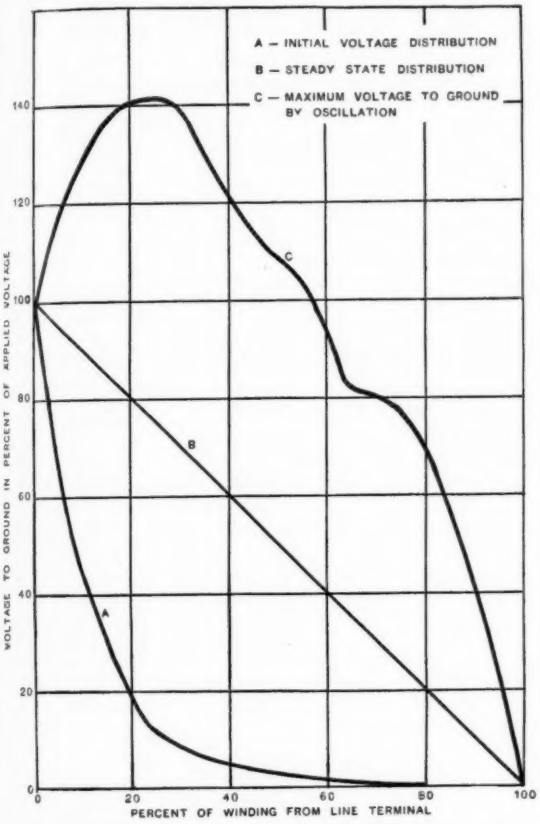


Fig. 4.—Voltage to Ground in Transformer Winding.

Considering any particular point in the winding, it will initially be at one potential as given in curve A, and finally at another potential as given in curve B. Since the characteristics of the winding are almost entirely composed of inductance and capacity, the resistance component being negligible in comparison, the circuit around this particular point will be oscillatory. In moving from the initial to the final values the potential will, therefore, overshoot the mark and reach the value shown in curve C. The potential will then oscillate between curves A and C, the oscillations gradually dying away until the final value of curve B is reached. It is apparent, therefore, that, in this process of oscillation, potentials giving stresses between windings and ground considerably worse than either initial or final distributions will be obtained.

Limitation of Local Stresses.

In order to reduce the stresses in the windings due to a surge, there are here two problems to be solved.

(*a*) Oscillations within the windings should be eliminated so that potentials will not rise above curve B. This limitation will prevent excessive local stresses between any part of the windings and ground.

(*b*) The windings should be so designed, if possible, that the initial distribution is more nearly uniform, that is, nearer curve B than curve A, so as to avoid excessive stresses between turns and sections of the winding.

Methods of improving the voltage distribution consist, first, of proportioning the windings dimensionally and geometrically to give a better inter-relation of capacitances between turns, coils, &c., and, secondly, of improving the dielectric flux distribution and compensating for the shunt capacity current by means of electrostatic shields.

All of the more experienced manufacturers of transformers take such of these precautions as are practicable and not unduly expensive in the design of their transformers to minimise the damaging effect of surges on the insulation. Such precautions include suitable proportioning of coil dimensions and the fitting of electrostatic grading rings and equalising shields at the ends of the windings to reduce the concentration of stresses on the end-turn insulation.

Electro-static Shields.

Transformers have recently been put on the market having an elaborate development of these simple expedients. An arrangement of high-voltage electrostatic shields reduces the intermediate oscillations within the windings and prevents the potentials rising to the values shown by curve C. Many technical articles have been written explaining the action of these shields with the help of more or less complicated mathematics and equivalent electrical circuits. The effect of the shields can, however, be easily demonstrated visually by regarding them purely as a means of controlling the dielectric field distribution. Fig. 2 shows in simple form the dielectric field of a single high-voltage winding, the upper end of which is connected to the line terminal, whilst the lower end is earthed. The earthed bodies on each side of the winding represent the core or low-voltage windings and the tank side, respectively. The small figures show the potential distribution throughout the winding corresponding to incoming surges of 100.

It is obvious from this field that the potential

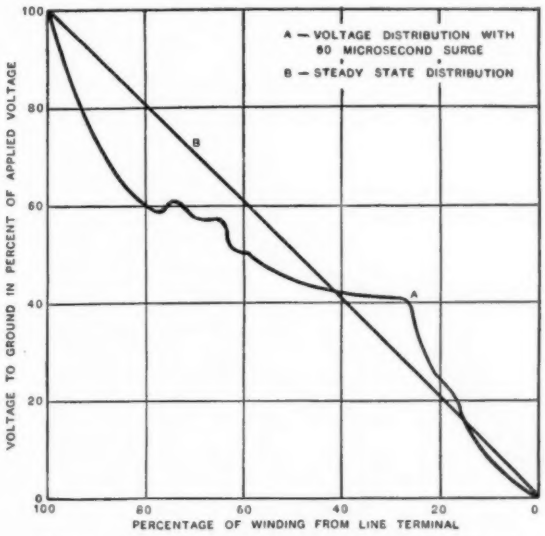


Fig. 5.—Maximum Voltage to Ground with 60 Micro-second Surge.

gradients are most severe at the entrance to the winding, thus causing concentration of the surge on the end turns. In fig. 3 the same winding is shown with the addition of electro-static shields. The dielectric field distribution is now entirely different, and the spacing of the shields is such that the potential of the space taken up by the windings falls gradually from the line end to the earthed end of the winding. The initial distribution of the surge is, therefore, much more uniform than where no shields are fitted.

It should be noted that all of the shields are at line potential and require insulating both from the remainder of the winding and from the transformer tank. It will be shown that these complications are

entirely unnecessary, and in fact reduce the reliability of the transformer by increasing the number of points at high potential within the windings. If, for example, the probability of the main high-voltage insulation breaking down is P, the probability of failure with non-resonating shields fitted will rise to 3P or 4P.

Maximum Wavelength of Surges.

The theory of oscillations and initial and final voltage distributions resulting from an incoming surge has just been described, but there is profound error in regarding curve C of fig. 4 as of practical importance, or, indeed, as indicating the most important conditions within an ordinary transformer winding.

It was necessary to assume in the technical explanation given that the incoming surge was of infinite length, and that, therefore, the final distribution was uniform and indicated by curve B. In actual practice no surges are of infinite length. Within the last few years there has been abundant evidence to show that the longest surges do not greatly exceed 60 micro-seconds in length, this time being measured from the beginning of the surge to a point at which the surge has fallen to half its maximum value. Under these practical conditions no surge is long enough for the final distribution, as shown by curve B, to be reached. Such oscillations as there are do not occur about a line such as curve B, but about values between curves A and B. The maximum potentials occurring during oscillation will, therefore, be lower than those given by curve C of fig. 4. Actual tests carried out with severe surges show that in practice the maximum potentials reached within the transformer windings, whether due to oscillations or to initial or final distributions, seldom exceed the normal value due to uniform distribution.

The curves in fig. 5 have been taken from the *Transactions* of the A.I.E.E., volume 49, page 68; they show the maximum voltages to ground (with solidly grounded neutral) obtained by oscillation from a 60 micro-second surge. It will be seen that, so far as potentials to ground are concerned, they differ very little from uniform distribution. Obviously no complicated or expensive shielding arrangement is desirable to improve a distribution already so good as this.

Advertising for Contractors.

In a previous article the author mentioned that the usual forms of advertising were not easily adapted to the electrical contracting industry, and he now suggests ways in which the contractor can attract business.

By H. R. TAUNTON.

TO-DAY is the day of advertisement. He who shouts loudest shouts last: he survives when his competitors who have clung to the dignified silence of their grandfathers' methods are silent for evermore. As the poet tells us,

> "He who whispers down a well
> About the goods he has to sell,
> Will never make as many dollars
> As he who climbs a tree and hollers."

The electrical contractor must "holler" with the rest—a little louder if he can—if he would have his share of the dollars. His wares will not sell themselves. Considered as luxuries, the public has to be educated to the point of wanting them from the trade as a whole. Considered as necessities, it has to be induced to favour those of the particular advertiser, even as it favours special brands of such other necessities as bread and beer. Which conveniently divides our subject for us into two headings: individual advertising, and collective advertising.

As was pointed out in a recent article in the ELECTRICAL REVIEW,* the contractor who wants to make an individual appeal is handicapped by the fact that ordinarily he has nothing to offer the public which his competitors cannot claim also to have. He has no special talking point. That definitely cramps his style and limits his profitable fields of publicity.

Take first its most obvious form, advertising in periodicals and newspapers. That is practically useless to the London firm, unless it happens to specialise in country-house plants. If it has some side-line to distinguish it from competitors who are wholly electrical, that is another matter, but one outside our present survey. It is of little use its featuring any electrical speciality, except in the rare case when it enjoys an exclusive agency. It would be folly, for instance, for a contractor to waste money on proclaiming the merits of certain radiators or fans when the manufacturers, who can better afford a national campaign, are already doing so more effectively.

The provincial firm is in a better position. It can cultivate a smaller field more intensively, with the advantage of lower rates for space. It will probably hold certain agencies for specialities, and so obtain a direct result from any advertising of them. In any case, by the mere reiteration of its name and address it is able to impress the fact of its existence on the memory of the limited circle to which it looks for possible orders.

Press Publicity.

This is not the place for a dissertation on the technique of preparing Press displays. Numerous handbooks are available, and any contractor about to spend money on advertising should first spend a little on a manual which will teach him how to advertise. The art is not to be learnt by intuition.

Here are a few elementary pointers:—

Before drafting your copy, study a few issues of the paper in which it is to appear. Observe the types, the borders, and the general layout of the various displays; and then make it your object to achieve something different, something that will stand out from the clamouring host by its very difference. That is the keynote of effective advertising: first, to catch the eye, and then, having caught it, to hold it.

A convenient shape—*e.g.*, two inches of double column instead of three of single; an original border; a good block, if possible; a pithy phrase in bold type; all these serve to catch the eye. In this connection, avoid the common mistake of making your name the prominent feature of a display. If you can't think of any caption more original than "Electrical Contractors," it will serve you better to draft out your display as "ELECTRICAL CONTRACTORS, Smith, Jones & Co.," rather than "SMITH, JONES & CO., Electrical Contractors." "Smith, Jones & Co." means nothing to a potential customer who may yet be looking for "Electrical Contractors."

Having caught his eye, don't irritate or weary it. Don't try to make too many points: if you are advertising specialities concentrate on one at a time. Avoid crowding your space with reading matter; don't be diffuse or prosy. Make your point as tersely as possible if you would have it read and remembered. Give your

* "The First Essential," ELEC. REV. December 5th and 12th, 1930.

matter "plenty of air": wide margins and good spacing both attract and relieve the eye. And finally, don't mix your types. Better two or three sizes of a good plain type than half a dozen of the "ornamental" types beloved of the cheap printer. The combined use of varying types with effect requires great discrimination.

Having decided to allocate a limited sum to Press advertising, it is better to spread it over as long a period as possible, provided it will command an adequate space, at reasonable and regular intervals, rather than to plunge it all on one or two ambitious displays to be followed by a long silence. You are more likely to attract the friendly attention of a man by repeatedly tapping him on the shoulder than by thumping him on the back and running away.

Letters and Pamphlets.

The next obvious form of publicity open to the contractor is postal publicity: form letters, leaflets, folders, pamphlets and booklets. Here again the provincial man has a certain advantage over the Londoner, for the same reasons as apply to Press publicity. There is no reason, however, why the latter, if he really has any special point that can be effectively made through the post, should not use this form of advertising with advantage. Compared with his confrère in the provinces, he is handicapped by a greater competition and a more sophisticated public. Accordingly it behoves him to exercise the greater judgment in compiling his mailing list, which in the result may be limited to his own circle of past and present customers.

Except as a means of sounding prospects in a newly developed area, or perhaps as a cover to a leaflet illustrating some speciality, form letters are of little use to a contractor. If circumstances warrant their use at all, the greatest pains should be taken with their composition. They have only a few seconds in which to make their point before they are cast automatically into the waste-paper basket, and their only chance of doing it lies in their being clear and concise. They must be on really good paper, if the firm's standard stationery is not already as good as it should be, and particular care must be taken to give them the appearance of being an individual communication—a matter of matching the addressee's name with the body of the letter.

Of leaflets and folders little need be said. Their application is principally to the selling of supplies and specialities, such as lamps and domestic devices; and the needs of most contractors are amply filled by the "literature" obtainable from manufacturers for overprinting. That being so, it is rarely worth a firm's while making up a special folder of its own, unless it be a short list of contracts carried out or, say, an offer of maintenance. In any case, this type of matter is best distributed as enclosures in current correspondence, and so hardly comes under the heading of general publicity through the medium of a mailing list.

Pamphlets and booklets—technically a pamphlet is a booklet of less than six pages—are not so easily obtainable from manufacturers; or if they are, it is only in limited quantities. It is a question of relative cost. If suitable publications can be had, their distribution is therefore limited to selected cases, where they are most likely to bring results.

To those firms who can afford it a booklet recording their activities past and present, or illustrating some such speciality as country-house plants or theatre installations, will be found a valuable form of propaganda, particularly in backing up an inquiry or accompanying a quotation. Its cost will prevent its general distribution to an extended mailing list, but it can be used as the motif of a publicity scheme, initiated by a form letter or circular covering a reply postcard and inviting applications for it.

A booklet of this kind is worthless if it be not well printed, well illustrated, and generally well got-up, preferably by an expert. It must be attractive, readable, and convincing, if it is to do its work before it is thrown away, and any shoddiness of appearance will inevitably damn it. All that spells expense, and limits its use and the number of firms who can use it.

Miscellaneous Opportunities.

The same remarks apply to catalogues and price lists. Certain firms in certain circumstances may find a catalogue—which to be any good must be well illustrated—of supplies and electrical appliances and novelties, a valuable sales medium. A well-thought-out scheme of distribution at Christmas time, for instance, may easily bring in profitable results; but the initial cost of an adequate edition has also to be well thought out.

Posters are of no use to electrical contractors. Placards—which are essentially permanent posters—may sometimes be so in certain positions, mainly as a means of keeping a particular name and address before a likely public. This purpose is well served by the sign board which most firms employ to announce the fact that they are carrying out work in the building to which it is affixed, for the name is then subconsciously associated with the ideas of substantiality and successful business. The contractor should aim in designing his signboard—which should preferably be of enamelled iron, not painted wood—to make it distinctive in arrangement and colour, so that it stands out from the many others which will probably be decorating the same building. This easy publicity is, of course, largely stultified on large contracts, where it is now the common practice to paint all the sub-contractors' names on one board.

Another simple form of publicity which is often neglected through sheer carelessness is the adequate labelling of the gear in a completed installation. Unless the contractor is ashamed of his work, he should surely be glad of a chance to tell the world who did it, and where they may apply for more of the kind. No job should be left until the supervisor has satisfied himself that at least all main switches and fuseboards bear his firm's name and address.

Coming nearer home, every contractor, whether he works from an office or a shop, should install an electric sign of some description. What could be more appropriate or more effective? Not only does it advertise his business but it advertises itself; and no contractor can afford to neglect the possibilities of the increasing demand for electric signs. Even a flood-lighted facia is better than nothing; but preferably the sign should be as striking and elaborate as he can afford to install, and it should be changed from time to time for anything more novel and up-to-date.

The Shop Window and Interior.

To those contractors who run a shop the window display is obviously one of their most important publicity media. Some of the principles stated in respect of Press display apply equally to window display. It is as fatal to overcrowd your window as to overcrowd your newspaper space. Do not distract the eye by gaudy trimmings—you are not selling drapery—nor by glaring lights. Your window, if it is nothing else, should at least be an object lesson in the art of effective illumination. It is good policy at times to concentrate on the display of a single article, just as in a newspaper it is well to emphasise a single point, rather than to confuse the passer-by with an attempt to show him all your dazzling variety. Generally speaking, the simpler and more concentrated the scheme of window dressing, the more likely it is to halt the possible buyer. Add to that, clearly-marked prices—the average man hesitates to enter a shop without knowing beforehand what the adventure will cost him—frequent changes, and consistent brightness and cleanliness, and the rest is only a matter of taste and ingenuity.

What applies to the window applies largely to the interior of the shop or showroom except that, the customer having been induced to enter the place, there is no longer the need to emphasise a single selling feature. On the contrary, the object is now to offer him as wide a choice as possible of other goods, tempting him to open his purse wider than he intended. But that object will still be defeated by a jumble, without skilful grouping and adequate spacing. And, of course, it will be defeated by the indifferent, ignorant "salesmanship" too common in contractors' showrooms—but that is another story altogether.

With the exception of such trifles as calendars and

petty advertising novelties, and leaving out of the question the publicity value of an outside representative or canvasser, we have now exhausted the possibilities of direct advertising by the individual contractor. But there are open to him other forms of advertising not less valuable because they are indirect and intangible. The general appearance of the firm's business quarters, its furnishing, its stationery, even the wording and typing of its correspondence, all have a psychological effect, for or against, on possible customers. So, of course, has the personality of the principal, and of those of his staff who may come in contact with them; and, not less, the character and demeanour of the foremen and permanent outdoor staff. A man who is careful and clean in his work, good-natured and obliging, is a definite advertising asset to the firm which is given the credit of his virtues.

This indirect propaganda costs little or nothing in hard cash but, because it is permanent and cumulative, it is worth more than the heaviest allocation for direct publicity could hope to realise. Without the goodwill—using the word in its primary sense—without the good word of a satisfied body of customers, the profitable results of the most intensive advertising campaign are but ephemeral, a ricketty structure without foundation which must crumble away with any slackening of an expensive publicity.

Co-operative Propaganda.

So much for the advertising media available to the individual, competing with his fellows for the possible customers in a limited field. There is, however, a wider form of advertising open to him as one of the general body of electrical contractors, the fruit of which may in the long run be no less to him: collective advertising. It has not the handicap imposed on the individual contractor's publicity: lack of talking points. It has at command facts and arguments unlimited to point the superiority of electricity as an illuminant, and its advantages for power over gas and steam. It can concentrate on a single theme, in endless variety withal: to educate the public to look upon electricity as a necessity. All to the benefit of the electrical trade as a whole, and to that of the individual contractor as a member of it. But he must adequately support the movement.

The E.D.A. is, of course, the leader in it, assisted in narrower fields by trade organisations such as the E.C.A. and the N.R.E.I.C. These bodies need no advice on how to spend to the best advantage the funds at their disposal for publicity. Their achievements may be open to criticism, but in their present stage of development adequate support would be more useful to them. The loudest critic is not always the largest subscriber.

Apart, however, from supporting the efforts of these organisations, there is no reason why contractors should not form small local combinations for the purpose of collective advertising. No reason, that is, except the mutual distrust and jealousy all too common among the smaller firms, who would rather sink individually than see their fellows swim with them. Such combinations would hardly be feasible in London, but in the provinces it should be easy enough for all the genuine contractors in a town to get together, plan out a publicity campaign for the common good, and provide in agreed proportions for the necessary expenditure.

Such publicity would naturally be on the lines of that of the E.D.A., boosting electricity or some particular application of it—fans, say, in the summer. It would preferably be anonymous, not only because any attempt at marshalling the names of the subscribers would certainly dissatisfy five out of six of them, but because an anonymous appeal would have an air of disinterestedness which would have a strong psychological value. It would principally be confined to Press displays—and it could afford larger and so more effective ones—but it might on occasion be extended to a postal campaign: for instance, in developing the possibilities of a new extension of the mains.

Collective advertising of this description need not in any way conflict with the individual efforts of the subscribers to it; while, on the other hand, it might by agreement, perhaps for a limited period, become a substitute for it. If it be granted, as it must be, that the activities of the E.D.A. are to the benefit of every member of the trade, then *a fortiori* the similar activities of a local combination, concentrated on their own immediate neighbours, could not fail to provide its members with benefits at least as definite. What each would make of the increased volume of trade would be a matter of individual enterprise.

Electricity for the Home.

Notes on Recently Introduced Domestic Appliances.

New Cooking Apparatus.

The " Stewart Sunbeam " electric toaster, fig. 1, a recent introduction by the COOPER-STEWART ENGINEERING CO., LTD., Stewart House, 136/137, Long Acre, W.C.2, has some unusually attractive features. First, it toasts from rising heat, with the result, it is claimed, that toasting is 50 per cent. quicker. A patented combined crumb tray and heat reflector is incorporated, making for ease of cleaning. A novel feature of the apparatus is that it is suitable for sandwich toasting. An ingenious two-slice turnover rack is also provided. The loading is 600 W, and the dimensions are 6¼ in. wide by 11½ in. long by 4 in. high. The apparatus is very robust and is finished in heavy nickel plating.

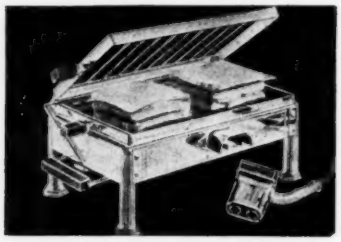


Fig. 1.—The " Stewart Sunbeam " Toaster.

The " Everhot " electric thermo-cooker, a recent introduction of " EVERHOT " ELECTRIC CO., LTD., 9-15, Oxford Street, W.1, is an auxiliary chromium-plated appliance of the type in which food is cooked with little or no water. It consists substantially of a double-jacketed, upright, cylindrical vessel containing the heating elements and insulating material between its outer and inner walls. It is provided with a removable insulated top lid or cover locked in place by a bail type lifting handle. The cooker is supplied with a length of flexible lead, plug and lamp or wall-socket adaptor, a wire stand, and three aluminium cooking pans with a total capacity of six pints. The interior dimensions are 7¼ in. diameter by 9 in. deep, and the cooker weighs 11¾ lb. Two-heat control is provided, with loadings of 450 and 100 W.

There are many new features embodied in the design of the " Walker " domestic electric cooker recently introduced by Messrs. WALKER, HUNTER & CO., LTD., Portdownie Iron Works, Falkirk, which are of importance to supply authorities as well as to the user. From the standpoint of low maintenance costs this cooker, with an interchangeable element unit for the hotplates, grill and oven, has obvious advantages, especially where large

hiring schemes are concerned. Stocks of spare element units are kept to a minimum, and fault determination and rectification is much simplified as compared with cookers having different types of elements as components. It is claimed to be the only cooker yet evolved with interchangeability throughout. The element unit comprises a patented method whereby the element track is doubled, and consequently very heavy wire is utilised, resulting in long life. The element is guaranteed for two years. From the housewife's point of view the cooker is particularly interesting. The " Pyrex " glass panel fitted to the door permits of viewing the process of cooking without opening the door, with resultant loss of heat. A foot-trigger arrangement for opening the door is also an advantage. The controls of the cooker are arranged for operation without stooping. The apparatus is designed for families of four to eight persons. Two totally enclosed hot plates are fitted to the hob, each measuring 8½ in. by 8 in. The grill is 9¾ in. wide by 9 in. deep, and the internal dimensions of the oven are 14 in. wide by 16 in. high by 16 in. deep. The overall dimensions are 36 in. high by 30 in. wide by 23 in. deep. The standard finish of the cooker is stoved black enamel, with the hob finished mottled vitreous enamel, but other finishes such as " all-over " vitreous enamel can be supplied to requirements. The model shown in fig. 2 is Cat. No. ED208. Another model, ED209, is similar, but this has a large plate-warming compartment fitted between the hob and oven. Optional fitments, such as a plate rack,

Fig. 2.—" Walker " Domestic Cooker.

thermometer, &c., can be supplied as desired. The total loading of the cooker is 7.5 kW.

New Electric Fires.

The accompanying illustration, fig. 3, depicts the " Belling Princess " imitation-coal fire which has been recently introduced by Messrs. BELLING & Co., Bridge Works, Southbury Road, Enfield. The framework of the fire is made of heavy-gauge sheet brass, and the three finishes, antique brass, oxidised copper, and oxidised silver, are electrically deposited. The imitation fuel has been considerably improved, and the flickering flame and smoke effect is very realistic. The outstanding feature of the appliance is the new type of firebar. This is of unique design, the spiral being laid in grooves on the front edges of which are rough pieces of black and fireclay, representing coal. When the spiral is on circuit the whole firebar gives an impression of glowing coal, and even when off circuit the appearance of the bar has not that bare look common to an ordinary firebar. The maximum loading of the fire is 2 kW, and the overall dimensions are 18 in. wide by 22½ in. high by 9 in. deep.

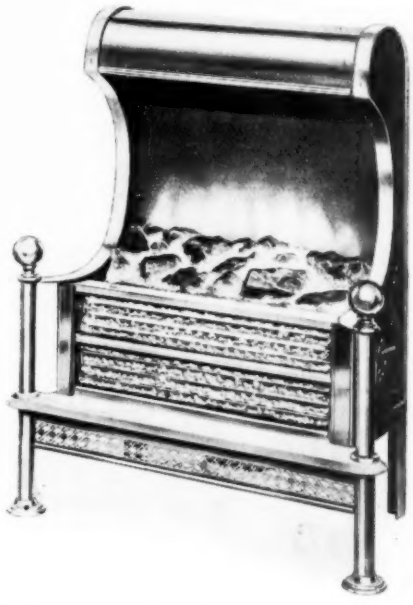


Fig. 3.—" Belling Princess " Fire.

A somewhat drastic departure from the usual design of electric fires is represented by fig. 4, which shows the " Rotaheater " fire recently invented by Mr. S. A. Horstmann, of the HORSTMANN GEAR CO., LTD., James Street West, Bath, which firm will produce the appliance to the order of the Household Appliance Co., Manor Gardens, Manor Street, S.W.3, which has been granted the sole British selling rights. The vertically placed element is secured to a base spun from sheet copper, and over the element is suspended a specially designed fan with blades of hardened sheet copper. The bearing on which the fan rotates is made of specially hardened carbon steel, and the pin which revolves on this steel bearing is an ordinary gramophone needle which can be changed in a few seconds, if found to be blunt. It is claimed that the " Rotaheater " offers a particularly economic means of heating by electricity, as there is no electrical energy used in rotating the fan, and the heat is circulated rather than concentrated in one beam. The fire will be supplied with elements for all voltages, and in capacities suitable for large or small rooms. Both copper and oxidised-silver finishes will also be available. A model inspected by us is loaded at 750 W. The origin of the fire may be of interest. Mr. Horstmann had a bowl fire which he used in his dining room, and it was a question of dispute as to which of his children should have the benefit of the direct beam from the appliance. The " Rotaheater " was Mr. Horstmann's solution of the difficulty.

Fig. 4.—The " Rotaheater " Fire.

Transport Co-ordination.

Extracts from the final report of the Royal Commission on Transport.

(*Concluded from page* 129.)

It has been claimed that after a certain seating capacity has been reached and filled, tramcars are more economical per passenger-mile than omnibuses. For this and other reasons witnesses who appeared on behalf of tramway undertakings expressed the opinion that, in London and other big urban areas where heavy traffic had to be dealt with tramcars were superior to any other form of road passenger vehicles and could not economically be replaced by omnibuses or railless trolley vehicles. So far as conditions in London are concerned, this evidence was supported by Sir Henry Maybury.

We believe this to be the case at the present moment in London, Glasgow, Liverpool, Manchester, and other large towns where the volume of passenger traffic at certain hours is very great, but we cannot believe that even in these populous centres the present state of things is likely to be permanent. Improvements have been, and are still being, made in tramcars, but the improvement in motor omnibuses in recent years as regards comfort, capacity, design, reliability, and economical running has been so remarkable that we feel certain that the time will soon arrive when the motor omnibuses —supplemented, perhaps, by new tube railways, &c.—will be able to carry the public, even in London and other big cities, as expeditiously and cheaply as the tramcar. For, notwithstanding the advantages possessed by the latter, some of which we have enumerated above, it possesses certain disadvantages so serious that we think it probable that had the motor omnibus been invented at the time when tramways were first authorised not a single mile of tramway would ever have been laid down.

Our considered view is that tramways, if not an obsolete form of transport, are at all events in a state of obsolescence, and cause much unnecessary congestion and considerable unnecessary danger to the public. We recommend, therefore, (*a*) that no additional tramways should be constructed, and (*b*) that, though no definite time limit can be laid down, they should gradually disappear and give place to other forms of transport.

We are not prepared to dispute that at the present time tramways are necessary in certain large towns if the traffic is to be carried with any degree of expedition, but we maintain that there are many other towns where they are definitely not necessary. A start should be made in the latter places towards the ultimate abolition by degrees of tramways and the substitution therefor of railless trolleys or omnibuses. The cost of making good the road after the removal of the tramway may be as much as £3,000 per mile.

The substitution of railless trolley vehicles may ultimately prove to be the best solution in certain cases (or at all events it may form an economical transition from the tramcar to the motor omnibus).

Railless trolley vehicles share with tramcars the advantage of simple and easy control, but in some respects they possess important advantages over tramways. The fixed rails in the carriageway disappear, and within the limits prescribed by contact with the overhead wires the vehicles can be steered. They can draw up at the kerb to set down and pick up with safety. They are relieved of the expense of road maintenance, though against this relief must be offset their liability to vehicle tax, based on seating capacity. They are probably the most silent of all public service road vehicles. They are not so liable to mechanical failures as omnibuses, and the breakdown of one vehicle does not seriously interfere with the entire service, as is the case with tramcars. Their chief disadvantages lie in the fact that, like tramcars, they are "route bound," and that, unlike tramcars, they can be driven from one end only, and, as constant contact with the overhead wires is essential, they require a large turning circle at terminal points.

Mr. Chamberlain, giving evidence for the Municipal Tramways Association, stated that the modern form of railless trolley "is more economical (than the tramway) and is peculiarly suitable for small towns which have no aspirations beyond their own boundaries"; but, for the future development of through traffic, he agreed that the motor 'bus was the only vehicle. This view is borne out by the fact that the average route mileage of the 23 railless trolley undertakings which were in actual operation during 1928-29 was only 5.77 miles, and that all these systems were converted from tramways.

The omnibus has the supreme advantage that it is a self-contained mobile unit. Except where the roads are obviously unsuitable by reasons of construction, width, or gradient, it can be operated on any route irrespective of distance; can be used to test the traffic potentialities of new routes; or can cater for thin or spasmodic traffic as the necessity arises. Further, it has to carry no capital charges for surface or overhead equipment and, although it is probably more expensive to operate per vehicle mile than either the tramway or railless trolley vehicle and the rate of depreciation is much more rapid, recent developments in the size and design of omnibuses tend to reduce the cost of operation per passenger mile.

In connection with privately-owned railless-trolley undertakings, which are subject to purchase by the local authority at intervals of less than 21 years, we recommend that in future the next date upon which the option to purchase becomes exercisable should be 21 years after the expiration of the current period.

In view of the opinion we have expressed that the use of tramways should be gradually discontinued, the necessity for a definite recommendation does not arise so far as tramways are concerned.

The obligations relating to road maintenance from which tramway undertakings seek relief appear to constitute a heavy burden on the operators. It must not, however, be overlooked that the licence duty on a tramcar amounts to only 15s. per annum, whereas a motor omnibus or railless trolley vehicle is taxed according to its seating capacity, and may pay as much as £96, which is the amount of the tax on a 56-64-seater vehicle on pneumatic tyres.

We are not prepared to recommend that tramway operators should be relieved of the obligation to maintain the road which was placed upon them by the Tramways Act, 1870.

We have endeavoured to outline four different plans (*viz.*, (i) nationalisation, (ii) rationalisation, (iii) a combination of both of these, and (iv) the formation of a Public Trust) whereby, through unification, complete co-ordination of the means of transport could be effected. We do not, however, feel that it is possible for us as a Commission to make any recommendations. There are two reasons for this:—

In the first place, the changes necessary would be of such magnitude, involving financial operations on a very great scale, that we do not consider that they could in any case be carried out immediately, and we have been endeavouring to discover how far and in what way co-ordination can be effected at the moment, having regard to the means whereby transport is being conducted at the present time.

In the second place, although we were able to reach unanimous decisions on all the points dealt with in our First and Second Reports, and with regard to all but two of the recommendations we have made so far in this our Final Report, we find it impossible to come to any unanimous decision on the far larger questions discussed above.

Legal.

Breach of Electricity Regulations.

AT Dumbarton Sheriff Court on January 12th William Denny and Brothers, Ltd., shipbuilders, Dumbarton, were charged with an infringement of the Electricity Regulations under the Factory Act. The defendants pleaded "guilty."

MR. GARRETT, H.M. Inspector, stated that the case was brought under No. 9 of the Electricity Regulations. On September 29th last an electrical inspector of factories had occasion to investigate the condition of a certain 250-V a.c. circuit supplying energy to the lamps used for dock lighting in a yard. He found one of the conductors of the system, the neutral wire, solidly connected to earth at the sub-station. He then made certain tests and found that the single-pole switch which controlled the system was placed in this conductor. This switch was not a link for testing purposes and was not a switch for use in controlling a generator. When the switch was open the circuit was broken. He found that the pressure on this wire was 250 volts. The object of the regulation was to ensure that, when single-pole switches were used, the effect of taking out the switch when it was in the correct wire would be to cut off all pressure from the whole of the circuit beyond the switch. The danger of having the switch in the neutral wire would be apparent, because the effect of this would be to leave the whole circuit charged up to its voltage, while so far as could be judged by the absence of lights or stoppage of motors, the circuit appeared to be "dead" and safe. Not even a skilled electrical engineer could tell without tests when the circuit was alive while apparently dead through the switch being in the wrong wire. Such a circuit was therefore a potential danger to every person whose work might bring him near it. Mr. Garrett said he did not suggest that this was a matter for which the directors of Messrs. Denny's were individually responsible. They must leave it to their technical staff; but they were responsible in law that their technical staff took such precautions as would prevent such switches being wrongly placed. It was hoped that one of the results of the case would be to make the technical staffs, not only of these works, but of all others in the district, realise their responsibilities with regard to the whole of the regulations.

The Sheriff imposed a fine of £10, the maximum under the Section.

The Oxford Electricity Litigation.

AT a recent meeting of the Oxford Corporation Electricity Committee it was reported that the Oxford Electric Co., Ltd., had lodged a petition of appeal with the House of Lords against the decision of the Court of Appeal, dated June 24th, 1930, made in the action of the Corporation against the company.

Radio Patent Extension Application.

IN the Chancery Division on January 14th Mr. Justice Luxmoore commenced the hearing of an application by Electrical Research Products, Inc., U.S.A., and by Standard Telephones & Cables, Ltd., for a five-years' extension of Patent No. 275, of 1915, for a push-pull amplifier for use in connection with wireless valves. The application was opposed by the Columbia Graphophone Co., Ltd., the Radio Manufacturers' Association, the Mullard Radio Valve Co. Ltd., Philips Lamps, Ltd., and the Mitcham Works, Ltd.

MR. WHITEHEAD, K.C., for applicants, said that in the use of the invention the input coil was bisected and equal, and opposite impulses were conveyed to two valves. The net result was that the grid of one was made more positive and that of the other more negative. Both these effects served alternately to augment one half of an alternating wave of electric current. The two valves must be similar and constant, and if that condition were satisfied the result was a most satisfactory amplification. For the first 6 years of the life of the patent the returns were *nil* owing to the war. Electric Research Products, Inc., were legal owners of the patent under an agreement of 1929, and Standard Telephones & Cables, Ltd., were licensees, and they had been legal owners of the patent down to December, 1929. Counsel said that the objectors contended that the invention was born before its time; that the valves of the character and quality needed to work the patent advantageously were not available until near the close of the war; and that the war instead of hindering, actually helped the exploitation of the patent.

SIR DUNCAN KERLY, K.C., for the Columbia Graphophone Co., said that there were two aspects of the question to be considered. One was the business side of it and the other was technical.

His Lordship inquired what the technical side of it had to do with the case. What he had to decide was whether there had been loss owing to the war.

Sir Duncan accepted that, but maintained that his Lordship would be unable to decide it without a consideration of the technical matters, and further, whether the invention was of value when made or whether it was only likely to be of value afterwards. The patent had no commercial value in the earlier years. There was no single profitable application of the invention except in connection with apparatus which was the subject of later invention. With regard to gramophone records its use in that connection was a case of a use which became possible by subsequent invention. Until there was an electricaly-produced record it would have been no good talking of broadcasting from the record; but the patent for the electrical cutting of records was only made in 1924 or 1925.

Sir Duncan submitted that if the Court came to the conclusion that there had been some loss it would have to consider how much, and that question could not be decided without considering the technicalities.

Mr. Whitehead said that one of his submissions was that it was sufficient on the words of the Act if the patentee was so occupied by the war that he could not devote himself to developing and exploiting the invention.

When the case was resumed on January 19th, Mr. Moritz, K.C., for the Mullard Co., submitted legal arguments, and Mr. Stafford Crossman, for the Comptroller-General of Patents, said he supported an extension for three years.

Mr. Justice LUXMOORE said that the evidence was conflicting as to whether broadcasting was established before or after it otherwise would have been because of the war, and he could not come to any conclusion on the subject. He saw no evidence to support the claim that the applicants had as the result of the war received compensation for the loss sustained on account of the war. Four years had been cut out of the life of the patent, and he proposed to grant an extension of four years. As the patent expired on January 6th, 1931, the extension would be by way of re-grant from that date. He did not think it would be right to impose any conditions as the applicants had undertaken to use their best endeavours to secure the registration of licences, which had been mentioned by Counsel for the Comptroller-General.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures.

Mr. Morrison's "Campaign."

The series of conferences which Mr. Herbert Morrison is addressing in a number of the leading cities, in an endeavour to speed up electrical development throughout the country, commenced on Monday this week when Mr. Morrison met representatives of Scottish supply undertakings in Glasgow. On Tuesday the Minister addressed a meeting in Manchester, and to-day (Friday) he is to speak at the Guildhall, London. A conference will be held in Leeds on Monday next while, later, representatives of West of England supply authorities will meet at Bristol. We propose to deal with the discussions at these conferences in our next issue.

Catalogues Required.

The ELECTRICAL TRADING ASSOCIATION, LTD., Aldwych House, Aldwych, W.C.2, asks for catalogues and publications from manufacturers of electrical apparatus and supplies, including electro-medical appliances and radio-receiving sets, accessories, valves, &c.

The New Chinese Tariff.

The *Board of Trade Journal* of January 18th contains details of the new Customs tariff put into force by the Chinese Government on January 1st. As we have already reported, the duty on electrical machinery for power generation and transmission, prime movers, and boilers and parts, has been reduced from 10 per cent. to 7½ per cent. *ad valorem*. Machine-shop tools (including electrically-operated types) are also subject to a reduced duty—5 per cent. instead of 10 per cent. The duties on railway and tramway supplies have been similarly reduced. No change is made in the 10 per cent. duty on cords, wires, cables and other electrical materials not otherwise provided for, or in the 12½ per cent. duty on telegraph and telephone instruments and parts. The duties on other electrical goods are increased as follows: "Bulbs, switches, &c.," from 10 per cent. to 15 per cent.; electrical heaters, fans, &c., from 10 per cent. to 20 per cent.; electrical accumulators, batteries, condensers, and parts thereof, from 10 per cent. to 15 per cent.; and radio sets and parts, from 12½ per cent. to 12½-20 per cent.

A Ferranti Endowment.

The employés of Messrs. FERRANTI, LTD., Hollinwood, have decided to endow a bed in the Oldham Royal Infirmary in memory of the late Dr. S. Z. de Ferranti.

New Indian Companies.

Among companies recently formed in India are the Larkana Electric Supply Co., Lahore, Punjab, capital 25,00,000 rupees; and the Nasik Deolall Electric Supply Co., Apollo St. Fort, Bombay, 10,00,000 rupees.

Manchester Tenants and Payment for Electricity.

The Manchester Corporation Housing Committee recently decided that the tenants of Corporation houses should pay for their electricity by means of an addition to the weekly rent, instead of quarterly, after securing the consent of a large majority of the tenants. Now, according to the *Manchester Daily Dispatch*, those tenants who have refused to agree to the new arrangement are being given notice to quit. The chairman of the Housing Committee states that the weekly payment was instituted for the benefit of the tenants, and the Committee was advised that the scheme could not become operative until it was applied all round. The notices given are purely formal, and the tenancies will be renewed immediately the new conditions are accepted.

New French Companies.

Among the concerns recently formed in France are the Société Lyonnaise d'Eclairage et de Force, Lyons (135, Avenue, Thiers); La Société Voltsampères, Paris (3, Rue Malher), £96,000, to manufacture accumulators and electrical apparatus (the Young Accumulator Co., Ltd., of New Malden, is interested in this new concern); La Société Française Cataphotes et Soleclair, Paris (9, Rue du Commandant Marchand), £16,000, to manufacture electric signs; La Compagnie des Tubes Luminescents et Fabrication d'Appareils Electriques à Gaz Rares, Paris (35, Rue Beaubourg), £22,800, to manufac-

ture fluorescent and rare gas tubes for electric signs; La Société Claude Lumière pour les Applications des Gaz Rare à la Lumière (Procédés Georges Claude), Paris (3, Avenue de l'Opéra), £24,000; and La Société Hydro-Electrique du Quercy (S.H.E.Q.), Paris (5, Rue Jules Lefebvre), £160,000, to establish plants to utilise water power in the River Lot basin.

A Belling Cooker Display.

The accompanying illustration shows an attractive window display of Belling electric cookers at the showrooms of the North Metropolitan Electric Power Supply Co., Electricity House, Palmer's Green, N. As will be seen, the cookers range from those for small families to cookers for larger households.

A Belling Cooker Display.

Increased Sales by an American Group.

Increases in the output of electricity and the sale of domestic electrical appliances, in spite of the present world depression, are announced by the International Hydro-Electric System, a division of the International Paper & Power Co., and its subsidiaries, in a progress report just issued. The output of the system in the first eleven months of 1930 was 3,798,414,000 kWh, 8 per cent. greater than that during the corresponding period of 1929. Sales of electrical appliances by subsidiaries of the System for the first ten months of 1930 amounted, it is reported, to $1,913,821 (£382,764), an increase of 22 per cent. over the corresponding period of 1929.

F.B.I. Delegation to Canada.

During the Imperial Conference, the Federation of British Industries entered into close contact with the Dominion representatives with a view to ascertaining what steps could be taken by industrialists to further the cause of inter-Imperial trade. In particular several interviews took place with the Canadian Ministers attending the Conference, and arrangements have now been made, with the co-operation of the Canadian Government for a delegation representing the Federation of British Industries to visit Canada, with a view to discussing with Canadian industrialists problems affecting the two countries. Sir James Lithgow, president of the F.B.I., will lead the delegation. It is proposed, in particular, to explore the possibilities of co-operation between Canadian and British industrialists, in order that co-operation may be, so far as possible, substituted for competition between the industries of the two countries. While the Federation sympathises with the legitimate desire of Canadian industry to supply Canadian requirements so far as possible, and is prepared to co-operate in any way desirable and possible in the development of industry in Canada, it believes that it is the desire of Canadians, in so far as they have to satisfy their wants from outside sources, to encourage imports from Great Britain rather than from foreign sources. The various problems involved will need careful discussion, but there is no doubt that, with the goodwill which exists on both sides, substantial progress should be possible towards a rationalisation of production between the two countries.

Company Registrations in 1930.

Messrs. JORDAN & SONS, LTD., company registration agents, Chancery Lane, W.C.2, report that 328 public companies, with an aggregate capital of £45,800,535, were formed during 1930. This represented a considerable decline from the 1929 registrations, which comprised 623 companies with a total capital of £156,192,157. The number of private companies registered was 8,082 (against 8,049), and their aggregate capital was £57,924,827 (against £73,375,965). Thus the totals were 8,410 companies with £103,725,362 capital, as compared with 8,672, capital £229,568,122, in 1929. We may again state that our "New Companies Registered" columns during 1930 gave particulars of 415 new electrical or allied companies (404 in 1929). The most prominent registration of an electrical nature during the year was that of the Morgan Crucible Co., Ltd., with a capital of £3,258,000.

Sir Hugo Hirst on Industrial Depression.

Sir Hugo Hirst, chairman of the General Electric Co., Ltd., replying to the toast "Our Guests" at the annual dinner of the Engineering and Allied Employers' Association in Birmingham on January 14th (at which Mr. Stanley Baldwin was the chief guest), said he came to Birmingham 30 years ago, and after carefully surveying the district, decided to make the city his industrial home. At the Midland works of the company with which he was connected, 14,000 people were engaged. Referring to the present state of industry, Sir Hugo said it would appear that other countries were doing as badly as we were. There was, however, little satisfaction in that, but it was important to notice that Italy, Germany, and America were facing the situation boldly and in a constructive spirit by framing measures for the reduction of expenditure and the increase of production. On our side at the moment we were doing nothing. By the word "we" he meant not any particular group of industrialists but the country as a whole. He denied that the industrialists of this country were not efficient or that they lacked skill in salesmanship. Considering the figures of employment and production, he thought we might ask ourselves whether we were really as badly off as the unemployment returns made us think. If, in spite of our difficulties and of the operation of "world causes," we were still producing an enormous volume of manufactured goods, our vigour in adversity, and our fertility during a relatively barren period, encouraged one to look into the situation which outwardly was so disheartening. Reviewing the position, he saw ample reason for confidence and hope.

"Synclocks."

Any new use of electricity is of interest to all electrical engineers, not so much on the score of the power consumed, but, far more, from the point of view of popularising the use of electricity by all and every possible means. For this reason, the recently-introduced "Synclocks" or synchronously-driven timepieces are sure of a ready welcome. All the troubles associated with the ordinary household clock are eliminated by the "Synclock." Modern power stations are tending more and more to maintain a rigidly exact mean frequency, so that wherever alternating current is available, a synchronously-driven timepiece, when once set to the right time, can be relied upon as correct to within a small fraction of a minute, and it requires no winding, regulating or re-setting. "Synclocks," which are made by Messrs. EVERETT, EDGCUMBE & CO., LTD., are available in various sizes, shapes and colours, to suit all tastes and all requirements. Messrs. TROUGHTON & YOUNG, LTD., were responsible for the display illustrated herewith. The picture gives some idea of a few of the many patterns which are available. The two suspended clocks have self-illuminated dials of novel form. The paper piping was in green

A Display of "Synclocks."

and gold and the word "Synclocks" was in black and green lettering on a gold background. Owing to limitations of space, it was only possible to exhibit the smaller dials, but the "Synclock" is suitable for the operation of public clocks which are notoriously unreliable. Any existing clock, large or small, can be converted into a "Synclock."

Recent Contracts.

Messrs. HICK, HARGREAVES & Co., LTD., Bolton, have received an order from the County of London Electric Supply Co., Ltd., for surface condensing plant with auxiliaries for two 75,000-kW turbo-alternators in the new Barking extensions. These condensers are claimed to be the largest yet ordered in this country. The company has also obtained an order for condensing plant and auxiliaries for two 20,000-kW turbo-alternators for the extensions to the Greenwich power station of the London County Council tramways.

Local Exhibitions.

STOKE-ON-TRENT.—With a view to assisting the British Electrical Development Association in its publicity campaign, and at the same time to encourage the utmost use of the electrical facilities in the city, Stoke Corporation Electricity Department, under the supervision of Mr. C. H. Yeaman, borough electrical engineer, arranged a series of six electrical exhibitions for the winter 1930-31. The first three were held in October

Stoke Electrical Exhibition.

November, and December last in the Burslem, Longton, and Hanley Town Halls, respectively, and the fourth was held from January 5th to 9th at Tunstall Town Hall. We illustrate the Corporation Electricity Department's stand, upon which a wide range of appliances was exhibited, including, in addition to full selection of domestic appliances, a comprehensive display of portable electric tools, &c.

Co-operative Selling Abroad.

Mr. G. M. Gillett, M.P., Parliamentary Secretary to the Department of Overseas Trade, speaking last week at a dinner given in honour of the Sheffield Industrial Mission to South America, said (according to *The Times*) that the Government's commercial representatives abroad, generally speaking, could not possess detailed technical information of manufacturing processes and all that they meant, but they could point the way to where opportunities for trade lay, and they could enable the business visitor to an overseas market to obtain all the technical information required. The Development Council of the Department of Overseas Trade was ready to help British manufacturers in every way that it possibly could to enable them to improve their commercial intelligence. If groups of industry would co-operate with the council in carrying out for themselves technical investigations overseas, every kind of practical support would and could be given them by the Department to obtain the many kinds of information about overseas market conditions which he believed that they did not possess but must require. He further urged upon his audience the desirability of non-competitive firms combining together to establish first-class selling organisations for the South American markets.

A Birmingham Exhibition.

That electricity is proving of great value, and is being increasingly used, in the scientific preparation and handling of all kinds of foodstuffs, was evident at the exhibition of the Birmingham and Midlands Grocers', Bakers', Confectioners' and Caterers' Association, which was opened at Bingley Hall, Birmingham, on January 13th. Visitors could not fail to notice the manner in which electrically-operated machines are making for greatly increased efficiency and cleanliness in the preparing and handling of foodstuffs. Also evident was the great improvement in the illumination of the stands, various special forms of electric lighting being used by a number of exhibitors. One of the outstanding schemes of illumination was that utilised by the Canadian Government Exhibition Commission, whose exhibit consisted of a huge dioramic map of Canada, 70 ft. long by 20 ft. wide. The whole of this was illuminated, without glare or shadow, by tubular lighting fittings in an elliptical cornice above the diorama, the lamps being concealed. Another notable feature of the Exhibition was the evidence which it afforded of the increasing use of ultra-violet lamps in the irradiation of dough and other foodstuffs, while there were many examples of electrical machines for the scientific preparation and handling of foodstuffs. The following firms exhibited: Artofex Engineering Works, Ltd., an electric bakery with "Vioroid" dough irradiation process, and electric ovens; G. Allen & Co., floodlights, shelf lights, and electrical shop fittings; W. E. Burnell, electrically-operated dough-mixing plant; Frigidaire, Ltd., automatic electrical refrigerating plant; General Electric Co., Ltd., "Magnet" baking ovens, scone plates, and dough-nut cookers; the C.O. Ericsson Engineering Works, Ltd., new examples of electrically-operated baking machinery; John Hunt (Bolton), Ltd., electric cake mixers; Berkell & Parnall's Slicing Machine Manufacturing Co., Ltd., electrical slicing machines, with self-contained motors; and the Peerless Electrical Manufacturing Co., Ltd., electrical food-preparing machinery and dish-washing machines.

The Census of Production.

Referring to the Census of Production, which is about to be taken in respect of the year 1930, the *Board of Trade Journal* says that in the course of the next few weeks firms engaged in productive work throughout Great Britain will receive the necessary forms. The hope is expressed that the firms concerned will fill in these forms accurately and return them promptly in order that the results of the Census may be published expeditiously. The last Census was taken in 1924. The primary purpose of the Census is to measure the quantity and value of the commodities making up the industrial output of the country. A measure of this output is of great utility to the business community, and for the guidance of Government policy. The Census figures also add value to other figures; for instance, it is only by comparison with figures of production that the full significance of the returns of imports and exports can be seen. Again, the figures provide the means of comparing the relative importance, and the changes in relative importance, of the different industries on the basis of value of output, numbers employed and power of engines installed, and they also afford a basis for estimating the national income. The returns made under the Census are treated confidentially.

The Census covers factories and workshops as defined in the Factories and Workshops Acts, including the productive work of public utility undertakings, mines and quarries and the building and contracting trades. Firms employing fewer than ten persons are exempted from the obligation to furnish detailed returns upon making a declaration showing the nature of their work and the number of their employés.

E.D.A. Activities.

The fourth conference of the British Electrical Development Association (Northern Area) was held recently in Newcastle, Mr. R. P. Sloan, managing director of the Newcastle-upon-Tyne Electric Supply Co., Ltd., presiding. According to the *Newcastle Journal*, Mr. Sloan said he believed that the North-East Coast Area, if it did not hold the record in membership, was near the top of the list. Mr. Maxwell Buist, engineer-in-charge of the N.E. Area, dealt briefly with the chief points of the North-East England Electricity Scheme.

Calendars, Diaries, &c.

Illustrations of patent coiling devices surmount a neat wall calendar, with monthly slips, sent us by MR. A. W. SAULTER, 240, Lower Road, S.E.8.

A wall calendar with monthly slips has been received from the LONDON ELECTRIC SUPPLY CORPORATION, LTD. Each slip contains illustrations of various domestic appliances, and is headed by an appropriate slogan.

A useful desk calendar with a black-enamelled metal base has been sent us by Messrs. LANDIS & GYR, North Acton, W. The daily slips are interspersed with illustrations of meters, transformers, and other products of the company.

Messrs. CROMPTON PARKINSON, LTD., inform us that 1931 refills are available to any of our readers who have one of the company's standard desk diary.

Yorkshire Electrical Contractors' Dinners.

The annual dinner of the West Yorkshire branch of the Electrical Contractors' Association was held at Leeds on January 13th, Mr. J. Gaunt Craven (branch chairman) presiding. Ald. E. J. Morrish, Deputy-Lord Mayor of Leeds, in proposing "The Association," said in referring to the electrical industry that the Minister of Transport was now going to give it a real push, which, combined with other factors, would make the future so promising that it was hardly necessary to wish the Association good luck. Mr. H. C. Hazel, president of the Association, responded and said no one could gauge the future of the industry, for in many departments of electrical activity they had done little more than scratch the surface of things. In the domestic field alone the possibilities were gigantic, but the industry would never achieve progress until it standardised its methods, unified its outlook, and moved forward as one organised body. The toast of the "Electrical Contracting Industry" was proposed by Capt. A. W. Brown, North Midland

Area Officer of the Electrical Development Association, who said they were fortunate in belonging to the only really healthy, live industry in the whole country. The toast was supported by Mr. A. G. Beaver, managing director of the Sun Electrical Co., Ltd.

The annual dinner of the Bradford branch of the Electrical Contractors' Association was held at the Great Northern (Victoria) Hotel, Bradford, on January 14th, Mr. Harry Moss presiding. Mr. T. Roles, city electrical engineer, in proposing the toast of "The Electrical Contractors' and Allied Associations and Officials," referred to the growth of the electricity undertaking, and said he thought it would be largely through the electrical industry that trade would get out of its present position. Ald. J. W. Longley (chairman of the City Electricity Committee), in responding to the toast of "The Electrical Industry," said that the Corporation had considered the establishment of a wiring department, but because of the excellent work which the contractors were doing and the reasonable prices which they were charging, it was decided that nothing further should be done.

Trolley-'Bus Manufacture in France.

In conjunction with the Société Vetra of Paris, the Société Générale de Constructions Electriques et Mécaniques Alsthom, of Colombes, Paris, has recently taken up the construction of electric trolley-'buses for which there is considered to be a good future in France.

B.E.A.M.A. at Buenos Aires.

The following companies are the principal concerns which are actively co-operating in the B.E.A.M.A. exhibit in the forthcoming British Empire Trade Exhibition at Buenos Aires:—

Allen West & Co., Ltd.	Ferguson, Pailin, Ltd.
Belliss & Morcom, Ltd.	Ferranti, Ltd.
British Electric Transformer Co., Ltd.	General Electric Co., Ltd.
British Thomson-Houston Co., Ltd.	Metropolitan-Vickers Electrical Co., Ltd.
Brookhirst Switchgear, Ltd.	C. A. Parsons & Co., Ltd.
Crompton Parkinson, Ltd.	A. Reyrolle & Co., Ltd.
English Electric Co., Ltd.	Richardsons, Westgarth and Co., Ltd.

The co-operation consists in the publication of special descriptive pamphlets (other than catalogues) printed in Spanish, for distribution from the stand, and a number of mounted photographic enlargements showing all types of electrical installations carried out by the firms concerned. In addition, for reference purposes, the B.E.A.M.A. stand will be equipped with a complete set of catalogues supplied by about eighty member firms and covering a greater part of their products. Many of these catalogues in Spanish will be available for distribution on the stand. Several of the companies named will also have separate displays of their own.

New Zealand's Electrical Imports.

During the September quarter of 1930 the imports of electrical equipment into New Zealand had a total value of £485,646. Of this the United Kingdom was responsible for £277,318, the United States for £114,857, Canada for £35,331, and Australia for £12,309. In the corresponding three months of 1929 the imports were as follows:—Total £484,636; United Kingdom, £244,394; United States, £145,245; Canada, £42,123; and Australia, £13,887.

A Brazilian Government Purchasing Department.

The Department of Overseas Trade informs us that the Brazilian Government intends to set up a central office for the purchase of all material required by Government departments, with a view to securing some measure of standardisation, uniformity of prices and economy. For this purpose the heads of Government departments have been instructed to prepare inventories of the material consumed during 1930, with an estimate of their requirements during 1931. The inventories will specify the quality or kind of the goods, the quantity consumed, the price per unit, &c.

Unemployment.

The registers of the employment exchanges of Great Britain showed an increase of 18,398 in the number of unemployed persons during the week ended January 12th. At that date the total was 2,636,168, as compared with 2,617,770 on January 5th, and 1,476,261 on January 13th, 1930.

Bankruptcy Proceedings.

H. M. HOWARD, 7, Branham Gardens, Earl's Court, S.W.—The receiving order in this case was made on June 10th, 1930, and accounts have been lodged showing total liabilities of £13.559 (unsecured £2,789) and assets estimated to produce £29,030, leaving a surplus of £26,240 after payment of all debts. At debtor's public examination on January 15th, he stated that he began business as a dealer in wireless and electrical instruments under the style of "Howard & Co." in 1924. He traded successfully until December, 1927, but subsequently sustained losses. In December, 1928, he began, in addition, to deal in watches and clocks, removing in January, 1929, to 2, Bloomsbury Place, W.C. In May, 1930, he ceased dealing in wireless and electrical instruments, and sold the watch and clock business to a company of which he became a director. He attributed his failure to losses by bad debts, heavy overhead charges, and bad trade. The examination was concluded.

T. J. HORN, trading as "Thomas Horn & Co.," 5, Harrogate Parade, Moortown, Leeds, electrician.—The following are creditors in this recent failure:—

	£		£
Brown Bros., Ltd. ...	24	Watmough & Co. ...	40
Hardman & Co., Ltd. ...	55	Walsh & Stevenson ...	24
James, —.	47	Wadsworth Sellers ...	68
Metallic Seamless Tube Co., Ltd.	109	Ward & Goldstone, Ltd.	39
		Kay, A. W.	193

J. SAYER, electrical engineer, lately carrying on business at 53, Great Marlborough Street, W.1.—Receiving order made January 8th on a creditor's petition. First meeting, January 22nd, and public examination, March 3rd, both at Bankruptcy Buildings, Carey Street, W.C.2.

C. AUSTIN (C. Austin & Son and Austin's Accumulator and Radio Service), wireless accessories dealer, &c., 97, Domestic Street, Leeds.—Trustee, Mr. H. C. Bowling, 24, Lower Bond Street, Leeds, Official Receiver, released December 19th.

L. J. COLLER (J. & F. Coller), electrical engineer, 63, Henton Road, Leicester.—Trustee, Mr. E. Barlow, 1, Berridge Street, Leicester, Official Receiver, released December 15th.

S. HOLMES, electrical engineer, 5, Gibson Street, Burmantofts, Leeds.—Last day for receiving proofs for dividend, January 30th. Trustee, Mr. H. C. Bowling, 24, Lower Bond Street, Leeds, Official Receiver.

R. E. YOUNG, wireless and electrical engineer, 8, Manchester Road, Swindon.—Last day for receiving proofs for dividend, January 27th. Trustee, Mr. J. W. Bridham, 38, Regent Circus, Swindon.

J. P. HAYES (Evening World Radio Gram Stores & Service), radio electrician, 17, Lawrence Hill, Bristol.—First and final dividend of 6s. 8½d. in the £, payable January 16th at the Official Receiver's office, 26, Baldwin Street, Bristol.

G. BLACKMORE, wireless engineer, 62, Coventry Road, Market Harborough.— First and final dividend of 11½d. in the £, payable January 22nd at the Official Receiver's office, 1, Berridge Street, Leicester.

SCHOLES ELECTRIC CO., electricians, 72, High Street, Sidcup.—Receiving order made January 12th on a creditor's petition.

E. P. STURGEON, electrical engineer, 88, Northgate, Hartlepool.—Receiving order made January 12th on debtor's own petition.

A. E. SHAPLAND, electrical engineer, 13a, High Street, Budleigh Salterton.—Trustee, Mr. W. R. Cocks, Exeter Bank Chambers, Broadgate, Exeter, Official Receiver, released January 5th.

C. SHEPHERD, radio engineer and wireless accessories dealer 69, Micklegate, York.—Trustee, Mr. D. S. Mackay, Duncombe Place, York, Official Receiver, released December 30th.

J. A. MORGAN, radio dealer, Old Queen's Head, Crickhowell.—First and final dividend of 1s. in the £, payable January 26th at the Official Receiver's Office, 34, Park Place, Cardiff.

Company Liquidations.

ASSOCIATED WIRELESS CO., LTD., 15, Miller Street, Camden Town, N.W.—Under the compulsory liquidation of this company, accounts have been filed showing liabilities of £3,800, against assets of £1,764, leaving a deficiency of £2,637 with regard to contributories, the issued capital amounting to £602. Mr. Naunton, Official Receiver, the liquidator, reports that the company was promoted by Mark Bolsom as a private company in 1929 to carry on the business of wholesale and retail wireless instrument makers, electrical and mechanical engineers and contractors, but the immediate object of the company was the acquisition from Bolsom of the goodwill of a business of a dealer in wireless sets which he had carried on at his private house for six months. The purchase price was fixed at £750, of which £600 was paid by cheque which was exchanged for 600 shares in the company. No other shares were issued; the company thus commenced business without any working capital. It started in November, 1929, and manufactured its own sets. Bolsom states that, as compared with his own trading prior to the formation of the company, the business increased for the first three months, after which it fell off. He retained the whole of the factory staff throughout the slack season, with the result that a heavy loss took place and the company was unable to meet its liabilities, and in addition there was a loss of stock. To meet pressing liabilities, £350 was borrowed from Mrs. Bolsom, and debentures for that sum were issued to her in May last. Eventually Mr. W. A. J. Osborne took possession of the assets as receiver for the debenture holder. The failure of the company is attributed by Bolsom to depression in trade, the continuance of the staff during the slack season, and the pilfering of stock.

DIRECTOPHONE, LTD.—Winding up voluntarily. Liquidator, Mr. J. W. Whybrow, 31, Bedford Row, W.C.1.

ELECTRICAL ENGINEERING SOCIETY, LTD.—A meeting of members will be held on February 19th at 3, Stanley Street, Liverpool, to receive an account of the winding up of the company by the liquidator, Mr. A. J. Glass.

HAROLD TAYLOR & CO., LTD.—Particulars of claims by February 17th to the liquidator, Mr. P. Hodgkinson, 48, Sunbridge Road, Bradford.

Private Arrangements.

P. WRIGHT, trading as Wright & Beyer, mechanical and electrical engineer, 3/5, Ivy Street, Birkenhead, and at Rock Ferry, Cheshire.—At a recent meeting of creditors a statement of affairs was presented showing ranking liabilities of £7,248 and net assets of £457, leaving a deficiency of £6,791. The deficiency account showed that in September, 1928, the assets exceeded the liabilities by £482, whilst there was a net profit earned in the business to August, 1929, of £349. During the succeeding year there was a net loss of £1,848, and since that date there had been a further net loss of £687. It was reported that the debtors had been in business for a considerable number of years, and the present position was attributed largely to a contract entered into some time ago. The principal creditors met about six months ago, and since that date the business had been continued with their assistance. The present meeting had been called owing to one creditor commencing proceedings. It was decided that a deed of assignment should be executed, with Mr. J. Hopkins and Mr. E. S. Brown as joint trustees, with a committee.

Book Notices.

"The All-Electric Home." By Michael Egan. Pp. 96; illustrated. London: George Newnes, Ltd. Price 1s. net.—This book is written in a pleasing and popular style. It deals with the uses of electricity in every possible domestic connection, and the contents were approved by the Electrical Development Association before publication. The work should, therefore, prove a useful addition to the propaganda literature of electricity supply undertakings and contractors, by whom it can be purchased from the publishers or from the E.D.A. at the following rates: 25 copies 16s. 8d.; 50 copies 31s. 3d.; 100 copies 60s.; less 5 per cent. on orders of 500 and over, and 10 per cent. on orders of 1,000 and over.

"The *Mechanical World* Electrical Pocket Book, 1931." Pp. 394; fully illustrated. Manchester: Emmott & Co., Ltd. Price 1s. 6d. net.—Many improvements are seen in the new edition of this valuable little publication. New contributions are to be found relating to operation and maintenance with regard to power station plant and electric traction, and the sections dealing with lighting circuits and switchgear have been entirely revised. The chapters concerning lamps and lighting have been expanded and brought up-to-date, and much of the matter in the early part of the book has been revised so as to cover d.c. generators, d.c. motors, synchronous motors, induction motors, auto-synchronous and traction motors. Many useful tables are included, together with data obtained from recent installations.

"The National Physical Laboratory, Collected Researches," Vol. xii. 1930. Published by H.M. Stationery Office, price £1 net.—This volume is entirely electrical.

"Mathematics for the Practical Man," by George Howe. Pp. v+143. London: Crosby, Lockwood & Son. Price 5s. net.

Plymouth Electricity Supply Workers' Wages.

It was reported at a meeting of the Plymouth City Council last week that the negotiating committee of the National Joint Industrial Council for the Electricity Supply Industry had agreed to the reduction of wages on or after January 1st, 1931—hourly wages by ¼d. per hour, weekly wages for a 48-hour week by 2s. per week, and weekly wages for a 47-hour week by 1s. 11¼d. per week, subject to the existing percentage relationship between the various owners being preserved. The agreement also provided that after this reduction there should be no further alteration of wages prior to July 1st next, after which the sliding scale agreement should come into operation, unless previously terminated by three months' notice. Alderman H. M. Medland stated that if the Plymouth City Council applied these reductions it could reduce the wages of some three hundred men employed in the Electricity Department from £2 14s. 11d. to £2 6s. 11d. per week. The cost of living, he contended, was a wrong basis, and would be unfair to those concerned, as everybody else in the Corporation undertaking was paid according to kilowatt capacity. Alderman Medland added that as secretary of the men's side he had that day received an application from the secretary of the area Industrial Council for a meeting to consider a reduction of one penny an hour under the agreement. The chairman of the Electricity Committee agreed that there should be a fresh survey of conditions, so that wages might be placed on some more equitable basis. He said that he regarded the new agreement as purely tentative and that the employés would in due course give three months' notice to terminate it, when steps could be taken to put stabilisation into practice.

By 45 votes to 27 the Council agreed not to accept the agreement, and the men's wages will be maintained at the present level for another year.

New Catalogues and Lists.

RIPAULTS, LTD., King's Road, St. Pancras, London, N.W.1.—A New Year's list of lampholders, switches, sockets, plugs, adapters, ceiling roses, and other electrical accessories. Also a leaflet describing a bakelite push-bar lampholder, a new three-way switch and lampholder, and an all-bakelite multiple plug.

EDWARDES BROS., 20, Blackfriars Road, London, S.E.1.—Lists Nos. 73, 74, and 75, dealing, respectively, with porcelain and glass lighting fittings; pendant fittings; and domestic electrical appliances, fittings, and general accessories.

A. W. SAULTER, 240, Lower Road, London, S.E.8.—Price list No. 7, relating to coiling devices for packing cable, &c.

ASCOG, LTD., 44, Theobald's Road, London, W.C.1.—A well-illustrated brochure (No. 119) showing an attractive new range of modern lighting fittings.

SADIA, LTD., 22, Newman Street, Oxford Street, London, W.1.—Catalogue "G," giving a detailed description of "Sadia" time-switches, thermo-regulators, &c.

THOMAS A. ROSE & SON, LTD., 25, Milton Street, London, E.C.2.—A leaflet illustrating a number of bakelite adapters, pear switches, sockets, plugs, &c.

CARRON COMPANY, Carron, Falkirk.—The third of the pamphlets, "Famous Men and Carron Works," relating to the Adam family.

BROOK MOTORS, LTD., Empress Works, Huddersfield.—A well-produced publication (No. 279), giving a detailed description of Brook motors for industrial drives.

GRIERSON, LTD., 4, Bloomsbury Place, London, W.C.1.—A folder dealing with various methods of electric warming.

The METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—Leaflet No. 747/6-1, describing some interesting electric winders recently installed at the Harworth Colliery.

LIGHTING TRADES, LTD., 30-31, Farringdon Street, London, E.C.4.—A most comprehensive catalogue of electric lighting fittings (No. 303), containing over 250 pages of illustrations and descriptive matter. Also well-illustrated catalogues of lighting glassware and "Redot" electric heating and cooking appliances.

R. F. WINDER, LTD., Belgrave Electrical Works, Leeds.—January list of new and second-hand surplus electrical material.

RHODES, BRYDON & YOUATT, LTD., Waterloo Engineering Works, Gorsey Mount Street, Stockport.—Publications M.16 and M.17 describing respectively the "Mopump" and "Mopump Junior" pumping equipment.

KLAXON, LTD., 26, Blandford Street, London, W.1.—Particulars of a new flameproof model signal for use in inflammable atmospheres.

The ELECTRO-DYNAMIC CONSTRUCTION CO., LTD., Devonshire Grove, London, S.E.15.—List No. 99, dealing with rotary transformers for operating a.c. radio receivers from d.c. supplies.

HEYES & CO., LTD., Water-Heyes Electrical Works, Wigan.—The January issue of the "Wigan Review," giving particulars of the "Wigan" explosion-proof lighting fittings and switch-fuses.

The EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, London, E.C.4.—An illustrated and priced catalogue (A.526) of lighting accessories. Also a leaflet (A.622) relating to the "Ediswan" moulded ceiling rose.

A. C. COSSOR, LTD., Cossor Works, Highbury Grove, London, N.5.—A folder describing the new 210 H.L. radio valve, which has a filament supported at seven points.

The Marking of Imported Meters.

The Board of Trade Standing Committee under the Merchandise Marks Act, 1926, has now reported upon the question of the marking of imported electricity meters and parts. The proceedings at an inquiry by the Committee were reported in our issue of October 31st last (p. 748). The report (Cmd. 3759, Stationery Office, 2d. net) reviews the evidence given at the inquiry and sets out the following conclusions and recommendations. The opposition to the marking of meters imported complete was in the main based on the erroneous supposition that it would be necessary to mark the parts as well as the meters as a whole. This is not the case. The Committee is satisfied that in the absence of an indication of origin purchasers are not always in a position to know whether they are buying British or imported meters. There would be difficulty in enforcing a Sale Order; the Committee therefore recommends that the meters should be required to be marked on importation as well as on sale or exposure for sale. It is further recommended that the indication of origin should be applied by die-stamping, or other mode of impressing or printing, either on the front of the case or on a metal plate securely attached thereto.

With regard to the marking of parts, the Committee considers that the case could be marked on the inside. So far as the rotor, the shunt system and the series system are concerned the Committee does not consider that there is any danger that the marking of these parts would be liable to cause purchasers to believe that the whole meter was foreign as the market is to a large extent an expert one. Although the Committee thinks that a case has been established for the marking of parts, the Customs authorities state that it would be difficult to distinguish these parts from other parts. The Committee, therefore, does not recommend an Importation Order for parts but an Order requiring them to bear an indication of origin on sale or exposure for sale both wholesale and retail. Both applicants and opponents declared themselves willing to refer to the National Physical Laboratory the question whether marking would involve the risk of injury to the parts. The Committee has come to the conclusion, however, that the method of marking should not be restricted to a mark applied indelibly by die-stamping or engraving, as proposed by the applicants, and considers that in the marking of parts the

alternative of stencilling or printing should be allowed. As it is not impossible that a very few exceptional cases may arise where painting is not found to be practicable, the Committee suggests that there should be an exemption for proved cases of this kind. It does not consider that there is any sufficient ground for requiring the marking of containers nor does it consider it necessary to specify a minimum size of lettering. It is recommended that the Order both for complete meters and for parts should come into force on July 31st, 1931, or three months after the date of the Order, whichever be the later date.

For Sale.

Southend-on-Sea Electricity Department invites tenders for the purchase of miscellaneous plant.

A freehold factory is offered for sale at Edmonton by Messrs. Hillier, Parker, May & Rowden.

Offers are invited by the Harrogate Corporation for the purchase and removal of the jobbing plant at the Electricity Works.

(See our advertisement pages to-day.)

Social Events.

The annual staff dinner of the Enfield Cable Works, Ltd., was held last Saturday at the Midland Grand Hotel, St. Pancras, and was attended by some 150 employés and guests. The Earl of Verulam, chairman of the company, presided. In proposing the toast of "The Company," Dr. E. Bowden made a brief reference to its activities during the year. He said that the cables for Sydney Harbour had been completed and delivered up to time, and several further large contracts were in hand. With regard to work in connection with the British grid, contracts had been secured for the cables and towers for the North-West England Scheme, and also for cables for the Mid-East England Scheme. Responding to this toast Lord Verulam said that in almost all trades the year 1930 had been one of the most lamentable depression. He was pleased to say, however, that the company's balance sheet for 1930 would show small difference from that for 1929. Brief and witty speeches were also made by Messrs. E. C. Pentney, H. C. Rose and Dr. Wright. After the speeches followed dancing to music provided by the Sommerfield Orchestra. Many of the old-fashioned dances were revived and proved very popular. The success of the evening's arrangements were due to Mr. F. C. Tibbatts and a very capable committee.

On Friday last we had the pleasure of witnessing an excellent performance of the well-known farce "Eliza Comes to Stay," which was presented by the Philips Social & Sports Club at Cripplegate Institute. The play is a difficult one for amateurs to attempt in that the humour relies, to a considerable extent, upon character studies, which require consistent concentration. The performance therefore of Miss Margot Bowdler as "Eliza" was extremely good, her acting provoking a continuous flow of laughter. The Hon. Sandy Verrall (Mr. A. B. Calkin) was very amusing, as was also his friend, Montague Jordan (Mr. A. J. Latreille). Miss Constance Jones gave a finished performance as Vera Lawrence, the actress prepared to marry the highest bidder, while Mr. T. Grimwood (Alexander Stoop Verrall) and Miss Doris Horton (Lady Pennybroke), ably discharged the duties of aristocrats with Victorian ideas. Mr. H. Bennett contrived to make the stage valet human and Miss Lilian Chapman as Mrs. Allaway, Eliza's nurse, adequately played her part. This is the first of the Dramatic Club's performances we have witnessed. We do not know if it is its first attempt, but in any event we predict that, like Eliza, it has come to stay.

The outcome of the first meeting between Henley's and Siemens on December 6th in the first round of the C.M.A. Football Cup competition having resulted in a drawn match, the teams met again on January 10th on Henley's ground at Gravesend, when Henley's won by three goals to one. After the match the teams and visitors were provided with tea in the all-electric canteen at Henley's Gravesend Works. Henley's will now meet the Union Cable Co.'s team in the second round, at Dagenham.

Over 100 persons assembled on January 9th in the canteen of the "Unity" Works of Messrs. Young, Osmond & Young, Ltd., Welwyn Garden City, on the occasion of the fifth annual works social. All branches were represented, and after partaking of an excellent repast the whole assembly passed out to the forecourt to witness a firework display. After this there was a concert and dancing.

The annual social given by the directors of Messrs. Heyes and Co., Ltd., to the staff and employés was held on January 15th at the Court Hall, Wigan. The festivities commenced with tea, at the conclusion of which Mr. A. V. Heyes, director and general manager, expressed the regret of the governing director, his father, on his absence owing to illness. The works manager, Mr. Cartwright, thanked the directors for their hospitality and the employés for their loyalty and good work during the year. A whist drive followed, the prizes being distributed by Mrs. A. V. Heyes, and later there was dancing and an entertainment.

The directors of Santon, Ltd., recently entertained their staff to a whist drive and dance at the King's Head Hotel, Newport. Nearly 200 were present and the proceedings were opened with the whist drive for which a number of prizes were given. This was followed by a dance with some amusing competitions. An enjoyable evening was terminated with an expression of thanks to the directors.

Electrical Exhibitors at the B.I.F.

In a leaderette last week we referred, in error, to a list of exhibitors "in this issue." This list actually appeared in our issue of January 9th.

French Foreign Electrical Trade.

According to the official returns lately issued, the imports of electrical machinery and apparatus into France during the nine months ended with September last attained a value of £4,624,780, as compared with £3,653,670 in the corresponding period of 1929. During the same period the exports of similar material from France increased from £2,528,740 to £3,128,780.

Edison Swan Cables Joins the C.M.A.

As from January 1st, Edison Swan Cables, Ltd., is a member of the Cable Makers' Association, and will in future supply cables under the brands and trade marks of the Association, namely, "C.M.A.," "Vicma," "Nonazo," and "Vinazo."

Prices of Raw Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price Jan. 20th.	Fortnight's inc. or dec.
a	Acid, Oxalic ... ... per lb.	5¾d.	...
a	Ammoniac, Sal ... ... per ton.	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£17	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£13 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton.	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3½d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton.	£85 to £90	...
b	,, Wire ... ... per lb.	1/1 to 1/9	...
b	,, Sheet ... ... ,,	1/1 to 2/9	...
b	Babbitts Metal and Anti-friction Metals—		
	Grade I ... ... per ton net.	£114	£4 dec.
	Grade II ... ... ,, ,,	£83	£2 dec.
	Grade III ... ... ,, ,,	£50	£2 dec.
c	Brass (rolled metal 2" to 12" basis) per lb.	7¼d.	¼d. dec.
c	,, Tubes (Solid drawn) ... ,,	10d. to 10½d.	...
c	,, Wire, basis ... ... ,,	8¾d.	¼d. dec.
c	Copper Tubes (solid drawn) ... ,,	11½d.	...
g	,, Bars (best selected) ... per ton.	£75	£2 dec.
g	,, Sheet ... ... ,,	£75	
g	,, Rod ... ... ,,	£75	
d	,, (Electrolytic) Bars ... ,,	£49 17s. 6d.	...
d	,, ,, Sheets... ... ,,	£143 10s.	...
d	,, ,, Wire Rods ... ,,	£59 17s. 6d.	...
d	,, ,, H.C. Wire ... per lb.	7¾d.	...
f	Ebonite Rod... ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/1	...
h	Gutta-percha, fine... ... ... ,,	nom.	...
h	India-rubber, Para fine ... ... ,,	5½d.	¾d. dec.
i	Iron, Pig (Cleveland No. 3.) ... per ton.	63/6	...
l	,, Wire, galve. No. 8, P.O. qual. ,,	£20	...
g	Lead, English pig... ... ... ,,	£15 5s.	£1 5s. dec.
g	Mercury ... ... per bot.	£22 7s. 6d. to £22 10s.	...
e	Mica (in original cases) small ... per lb.	6d. to 8/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plain castings ,,	1/1½d.	...
p	,, ,, drawn bars & rods ,,	1/0½d.	¼d. dec.
p	,, ,, rolled strip & sheet ,,	1/1d.	...
p	,, ,, wire ... ... ,,	1/1d.	¼d. dec.
o	Platinum ... ... per oz.	£6 15s.	...
d	Silicium Bronze Wire ... ... per lb.	9½d.	...
r	Steel, magnet, in bars ... ... ,,	7¾d.	...
g	Tin, Block (English) ... ... per ton.	£116 10s. to £117 10s.	£4 dec.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	2/11d.	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Orminston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
W. F. Dennis & Co

Reporting on January 17th, Messrs. James Forster & Co. stated that after a steady opening on Monday last week the lead market became weaker, prices finally closing at the lowest. Demand remains as dull as ever, and on the other hand there are no signs of a diminution of supplies. Owners and miners at Broken Hill have come to an agreement, so that for the time being there will be no interruption of supplies from that source. Although the price is now low in comparison with pre-war values, it does not look as if the bottom has yet been reached.

Trade Announcements.

MESSRS. BASTIAN & ALLEN, LTD., 26, Cross Street, Essex Road, N.1 (particulars of whose registration appeared in our issue of December 26th, p. 1100) inform us that they have acquired the stock, patents and goodwill of the Bastian Meter Co., Ltd. (incorporating Bastian & Allen), as from January 1st. The offices and works have been moved from Slough to the above address.

On January 26th, a new "Mazda" lamp depôt will be opened at 38, Friar Lane, Leicester. Large stocks of all types and sizes of "Mazda" lamps will be carried.

MR. S. W. BLIGH, electrical and radio engineer, of 2, North Lane, Canterbury, has opened additional showroom premises at 11, St. Dunstan's Street, Canterbury.

Detail Drawings with Tenders.

Opposition to the practice of requiring detailed working drawings with tenders for electrical equipment, or as an element of contract, was expressed in a resolution adopted recently by the executive committee of the National Electrical Manufacturers' Association of the United States. The resolution expressed the view that the practice of requiring detailed working drawings with bids or as element of contract was objectionable and worked a hardship on the manufacturer in that there was involved not merely unnecessary expense, but the demand for information and data which were the result of knowledge and experience, and were major elements of the bidder's "stock-in-trade." The Association therefore recorded its formal opposition to the practice. This opposition does not apply to such outline drawings of apparatus showing overall dimensions, assembly drawings of major components, wiring diagrams, performance data and other diagrams, charts, photographs, and instructions as are needed for installation, operation, and maintenance purposes.

Latvian Electrical Imports.

During October last Latvia imported electrical machinery, accessories, &c., valued at 706,000 lats (£28,240), as compared with 904,000 lats (£36,000) in the corresponding month of 1929.

Lighting and Power Notes.

Aberdeen.—LIGHTING OF SEA-FRONT.—A proposal to illuminate the Aberdeen sea front was considered at a recent meeting of the Links and Park Committee. It was reported that the estimated cost would be about £3,000. The Committee was of the opinion that the scheme was too costly and it was agreed to hold it over with a view to joint action with another Committee.

Argentina.—HYDRO-ELECTRIC SCHEME.—Plans have been submitted to the Minister of Works for the utilisation of the Rio Quequén for the production of power. The main project, which will be carried out by the Compañía Argentina de Fomento Industrial, S.A., is for an artificial dam near the La Dulce and La Salada lagoons, which together are estimated to provide a flow of 47,000 litres a second. It is proposed to erect three power stations which will have a total capacity of 21,000 kW. *Reuter's Trade Service* (Buenos Aires).

Australia.—VICTORIAN ELECTRICITY COMMISSION.—The annual report of the Victorian Electricity Commission for the financial year 1929-30 shows a net profit of £5,266. On briquetting operations there was a loss of £3,914, and on the brown coal mine, now closed, a loss of £820. The figures relating to the electricity undertaking show an expenditure of £1,554,138 and a revenue of £1,624,256, leaving a gross profit of £70,118. After deducting various items there was a balance of £10,000. Sales of electricity for the year totalled 394,754,454 kWh, an increase of 36,664,987 kWh as compared with the previous year; in the metropolitan area there was an increase of 30,000,000 kWh. At the end of the financial year £896,000 had been spent on the major extension of electricity supply, the total of the complete scheme being estimated at £2,806,000. The Commission has investigated new sources of power and the results suggest possibilities of combining the Hume reservoir with developments on the Mitta River; experiments on the Snowy River give similar hopes. The Commission is pursuing a policy of selling electrical appliances at reasonable prices and on liberal terms; 745 cookers were sold during the year.

Bradford.—CABLE EXTENSIONS.—The Corporation Electricity Committee is to extend feeder and pilot cables at a cost of £3,069.

OVERHEAD LINE APPEAL.—At a meeting of the Corporation Electricity Committee held recently it was reported that the Yorkshire Electric Power Co. had appealed to the Minister of Transport against the decision of the Corporation to refuse to grant the application of the company for permission to erect an overhead line on Corporation land at the top of Hollins Hills, and that the Minister had allowed the appeal.

Burnley.—MAINS EXTENSIONS.—The Corporation Electricity Committee recommends that sanction be obtained to a loan of £30,000 for mains and services.

Canterbury.—MAINS EXTENSIONS.—The City Council has applied for sanction to a loan of £12,719 for laying additional mains in the Old Dover Road and Whitsbale Road areas, and at Hales Place estate.

Continental.—SWEDEN.—The construction of another large hydro-electric power station is to be undertaken at the Kraangede rapids on the Indal river, in the southern part of the province of Jaemtland. The rapids are owned by a company in which shares are held by the town of Stockholm and five industrial companies, *viz.*, the Fagersta Ironworks, Bergslagens Gemensamma Kraftoervaltning, S.K.F. (Hofors works), the Korsnaes Sawmill Co. and the Sandviken Ironworks. This company, which is called Kraangede Aktiebolag, now has only a small share capital of Kr.350,000, but will issue new shares to the nominal amount of Kr.11,900,000, thus bringing the capital up to Kr.12,250,000. The construction of the power station will start this spring. It will have an initial capacity of 60,000 kW, but will probably be enlarged later to produce about 180,000 kW.—*Reuter's Trade Service* (Stockholm).

The electric power system of the Hammarforsen plant, belonging to the pulp timber and power concern of the Kreuger and Toll Company, has recently been connected up with that of the Kranfors Company, also part of the Kreuger Group. There now exists a unified power system along the coast with a length along the lines of about 600 km. The total combined water power of the Kreuger group now amounts to about 250,000 h.p.

FRANCE.—A concession has recently been granted to the Société Hydro-électrique du Drac Inférieure, of Grenoble, to establish a plant to utilise the water power of certain falls on the River Drac near Pont-de-Cliax (Isère). It is estimated that 11,500 kW is available.

ITALY.—It is estimated that the capacity of the electric power plants in operation in Italy at the end of October last amounted to 4,139,000 kW, as compared with 3,735,000 kW at the corresponding date in 1929, an increase of about 10.8 per cent. Of the total, 31 hydro-electric plants are responsible for 3,413,000 kW, and steam and internal-combustion engine stations for 726,000 kW. The output of electricity during the ten months ended October last is estimated at 8,357,966,000 kWh, as against 8,104,708,000 kWh in the preceding year.

Dewsbury.—NO WIRING DEPARTMENT FOR THE PRESENT.—The Town Council has decided not to establish an electric wiring department in connection with the electricity undertaking for the time being.

East Ham.—MORE PLANT REQUIRED.—At a recent meeting of the Corporation Electricity Committee, the engineer reported that in order efficiently to cope with the anticipated increase in the demand for electricity, it would be necessary for additional plant to be installed at the generating station. He submitted an estimate amounting to £5,736, for the supply of one 1,500-kW motor convertor with switch panel, cables, &c. The Committee recommended that the estimate should be approved.

Grantham.—NEW TARIFFS AND ASSISTED-WIRING SCHEME.—The Urban Electric Supply Co., Ltd., has introduced a two-part tariff, with a fixed annual charge based on floor area, and a certain quantity of electricity without further charge. Energy consumed in excess of the amount allowed will be charged for at the rate of 1½d. per kWh. For shops and business premises the fixed charge is based on the wattage of lamps installed, plus 1½d. per kWh consumed. The company has under consideration a scheme of assisted wiring under which it will wire four points free of charge for consumers who adopt the two-part tariff.

Irish Free State.—LIMERICK.—New tariffs are being introduced this quarter for business premises in Limerick which are not common with dwellings occupied by the proprietor of the business. The new rates will be: General lighting, 6d. per kWh; heating and other domestic purposes, 1d. per kWh; outside sign lighting, 2d. per kWh; late shop window lighting, 2d. per kWh.

Kendal.—LOAN.—The Town Council has applied for sanction to a loan of £4,000 for consumers' apparatus and cable in connection with the change-over.

Leeds.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to the borrowing of £450,000 for mains extensions.

PUBLIC LIGHTING.—At a recent meeting of the Corporation Lighting Committee, an application was submitted from the Alwoodley Park Estate Tenants' Association for the installation of public lighting in the district. The engineer and general manager submitted information with respect to the estimated cost of lighting the district by gas or electricity, and it was decided that the necessary public lighting should be carried out before next winter. The method of lighting is to be considered at a future meeting.

London.—ISLINGTON.—The Borough Council Electricity Committee has considered a proposal that the Council should cease to demand guarantees from persons desiring to take a supply of electricity. While believing that it would be against the interests of the undertaking that the guarantee should be dispensed with in all cases, the Committee has come to the

conclusion that where there is evidence of a demand on the part of consumers in any thoroughfare where mains are not already laid, facilities should be provided to enable the supply to be taken up without guarantee.

FULHAM.—The Borough Council has received sanction to loans of £10,000 for mains extensions, £12,500 for rental wiring installations, £5,000 for domestic apparatus, and £2,172 for sub-station equipment at Mirabel Road.

Manchester.—PROGRESS DURING NOVEMBER.—During the month of November the Corporation Electricity Department showed an increase of 2,052 kW in connections, bringing the total up to 443,370 kW. Applications received for supplies, including additional supplies, amounted to 1,519, representing a total of 3,761 kWh. The number of hired cookers connected increased by 106, making a total of 6,979 now on circuit. Applications for the hire of cookers numbered 134. Three new sub-stations were put into commission and new plant was installed at four existing sub-stations. The change-over from d.c. to a.c. had been completed in the cases of 13,084 consumers up to November 30th, while sanction had been given and work was in progress involving 1,324 consumers.

Musselburgh.—COUNCIL NOT TO PURCHASE UNDERTAKING.—The Town Council has abandoned the idea of exercising its option to purchase the local electricity undertaking from the Musselburgh and District Electric Light and Traction Co.

Nelson.—LOAN.—The Town Council has applied for sanction to a loan of £36,447, the amount of over-expenditure in respect of the electricity undertaking at October 27th, 1930.

Newcastle-upon-Tyne.—THE CORPORATION'S OPTION TO PURCHASE UNDERTAKING.—Owing to technical difficulties involved in connection with the change-over of the system of supply from d.c. to a.c., the Corporation Parliamentary Committee has recommended the Corporation to postpone until 1937 consideration of the purchase of the electricity undertaking of the Newcastle-upon-Tyne Electric Supply Co., Ltd.

Norwich.—ELECTRICITY SUPPLY TO STANNINGHALL.—The Norfolk County Council has agreed to the erection by the Norwich Corporation of an overhead line in connection with the installation of electric lighting at Stanninghall.

Okehampton.—COUNCIL'S CONSENT TO APPLICATION FOR ORDER.—The Rural District Council has decided to consent to an application by Mr. W. G. Heath for a Special Order to supply electricity to Okehampton and Tavistock and in the two rural areas. The Electricity Commissioners have intimated that the granting of a Special Order would enable a comprehensive scheme to be carried out in the area. If an Order is granted, it is proposed to reduce the maximum charges for the borough of Okehampton and the urban district of Tavistock from 10d. to 9d. per kWh, and in the rural areas from 1s. to 11d. per kWh.

Radcliffe.—GAS *versus* ELECTRICITY.—The Urban District Council has appointed a committee to report on the relative merits of gas and electricity for street lighting, domestic cooking, heating and power.

Rothesay (Bute).—PLANT EXTENSIONS.—The burgh engineer has been instructed to invite tenders for the installation of an additional 270-kW generating set at the electricity works. The estimated cost of the plant is £5,550.

Shepley (Yorks.).—LIGHTING OF THE COUNCIL HOUSES.—The Urban District Council has decided to have electric lighting installed in Council houses on condition that tenants pay an extra 3d. per week—2d. to cover the cost of installation, and 1d. for a sinking fund.

South-East Lancashire Electricity Advisory Board.—PROPOSED DISSOLUTION.—The Electricity Commissioners are to hold an inquiry at Manchester Town Hall on January 30th to consider the question of the dissolution of the Board.

Spalding.—LOAN.—The Urban District Council has applied for sanction to a loan of £10,009 for electricity purposes.

REVISED TARIFFS.—The following new charges have been adopted:—Two-part tariff "unit" charge: 2d. per kWh from March 26th to September 25th, and 3d. per kWh for the rest of the year. Domestic supplies other than for lighting: flat rate of 2d. per kWh from March 26th to September 25th, and 3d. per kWh for the rest of the year.

Stafford.—SUPPLY TO RURAL AREA.—With reference to the supply of electricity to Milford, Walton, and Brockton, the Rural District Council has been informed by the North-West Midlands Joint Electricity Authority that all the wayleaves have now been obtained for the overhead lines. The Authority has not decided upon a particular tariff, but the general scale of charges for other parts of the area are:—Lighting, flat rate: 9d. per kWh. Prepayment meter lighting: 11d. per kWh. Power and heating: 3d. per kWh for the first 250 kWh per quarter, 2½d. for the second 250 kWh, 2d. for the third 250 kWh, 1½d. for the fourth 250 kWh, and 1d. beyond. The minimum charge is to be 10s. per quarter. There is a multi-part "all-in" tariff for residences, with a fixed quarterly charge of 6d. per room, plus 2d. per kWh for the first 240 kWh per quarter, 1½d. for the second 240, and 1d. beyond.

Tilbury.—NEW ELECTRICITY CHARGES.—The Urban District Council has adopted the following scale of charges for electricity for domestic purposes: Up to 110 kWh per quarter, 2d. per kWh; 111 to 120 kWh, 18s. 6d.; 121 to 130 kWh, 18s. 8d.; 131 to 140 kWh, 18s. 10d.; 141 to 152 kWh, 19s.; beyond, 1½d. per kWh; with minimum charges of 6s. 8d. for each summer quarter, and 10s. for each winter quarter.

Whitby.—LOAN SANCTIONED.—The Town Council has received sanction to a loan of £5,202 for electricity supply purposes.

Tramway and Railway Notes.

Australia.—RAILWAY ELECTRIFICATION.—The Lidcombe and Bankstown Councils, N.S.W., are urging the Minister of Transport to consider the electrification of the Lidcombe-Bankstown railway.

Carlisle.—THE ABOLITION OF THE TRAMWAYS.—*Modern Transport* says that a further step towards the abandonment of the tramways in Carlisle has been taken, the Watch Committee of the Corporation having licensed a number of 'buses owned by Ribble Motor Services, Ltd., of Preston. The company has acquired the local tramway undertaking and proposes to substitute 'buses for trams as soon as possible.

Colne.—JOINT TRANSPORT BOARD PROPOSAL.—The Town Council is in favour of the proposal to set up a joint transport board to operate the whole of the municipal transport services of Colne, Nelson, and Bursley. The Colne tramways were originally owned by a private company, but they were bought by the Corporation after the matter had gone to arbitration. The result has proved that the purchase price was much too heavy, and as a consequence losses entailing a rate of 1s. 2d. have had to be met. During the past twelve months serious consideration has been given to the abolition of the entire tramway system of the borough and the substitution of 'buses, and it is thought that a solution of the difficulty may be found in the proposed transport board. The proposal is the more opportune because Nelson Corporation at the moment has no head official for its Electricity and Tramway Department. Up to the present the proposal for the joint board has been favourably received by the three corporations, and a joint sub-committee with power to engage experts has been appointed.

Continental.—BELGIUM.—During last year a further 110 km. of the lines owned by the Société des Chemins de Fer Vicinaux was converted to electric traction, thus increasing the total of electrified lines to 781 km. At the end of 1930 further lines of about 250 km. in length were in course of reconstruction and the capital had been provided for the electrification of a still further length of 140 km.

Lytham St. Annes.—ADVERTISEMENTS ON TRAMS.—The Blackpool Corporation has refused permission to the Lytham St. Annes Town Council for the placing of advertisements on the Lytham trams, on the ground that for many years it has been Blackpool's policy to refuse all types of advertisements on its trams, with the exception of those relating to purely local events.

Newcastle-upon-Tyne.—THE FUTURE OF THE TRAMWAYS.—At a recent meeting of the Corporation Transport and Electricity Committee two alternatives were put forward to deal with the Corporation tramway system. Recently there has been a big falling-off in the number of passengers using the tram service, and it was suggested that either the trams should be scrapped, or that speedy Pullman cars should be introduced in the city area and the 'bus service extended in areas where they would be more profitable than the trams. The Committee is to consider the matter again at an early date.

Nottingham.—REORGANISATION OF TRANSPORT.—A scheme for the entire reorganisation of the city's transport is being prepared by the Corporation Transport Committee. It is expected that in ten years the whole of the trams will have been dispensed with.

Southern Heights Railway.—PROPOSED NEW ROUTE.—*The Times* states that keen public interest has been created by the announcement that the Southern Heights Light Railway is applying to the Ministry of Transport for an Order authorising a deviation in the proposed railway, whereby it is estimated that a reduction of £17,245 will be saved upon the original estimate without materially affecting the course of the route or its efficiency. The original estimate was £58,997, and the cost of the railway, as altered, will be £41,752, according to the present estimate. The parishes in Kent and Surrey which it is proposed to link up by the Southern Heights Light Railway are greatly in need of improved transport facilities. The proposed deviation runs through land in the parishes of Cudham, Tatsfield, and Titsey.

South Africa.—RAILWAYS AND ELECTRICITY CHARGES.—Strong criticism of the accounts rendered by the Electricity Supply Commission for the supply of electricity is contained in the annual report, just issued, of Mr. J. R. More, general manager of the South African Railways and Harbours. The Railways

and Harbours pay the Commission nearly £500,000 per annum which, says Mr. More, he cannot check, and he regards it as unsatisfactory and unbusinesslike to have to accept accounts without being in a position to say whether they are correct or not. With regard to the question of the electrification of the Cape Flats and Belleville lines, which the Commission estimated would save £36,000 a year on electricity supplied to the railway administration from Salt River, Mr. More states that this would mean no saving in the annual bill for electricity. At present there was a loss of £32,000 a year on the Cape Flats line and electrification would mean a capital outlay of £47,000. It was improbable that there would be any increased revenue, and from the administration's point of view there was no justification for the electrification of either the Cape Flats line or the main line from Cape Town to Belleville.

Telegraph and Telephone Notes.

Australia.—TELEPHONY.—Telephone communication between Adelaide and Perth was opened at Christmas. It is one of the world's longest land lines; the channel involves trunk routes of 1,676 miles, and towns as far apart as 5,028 route miles (Geraldton, in Western Australia, and Cloncurry, in Queensland) will eventually be connected.

Canada. — TELEGRAPH MERGER PROPOSALS. — Sir Henry Thornton, president of the Canadian National Railways, announced on January 15th that the amalgamation of the commercial telegraph systems of the Canadian National and Canadian Pacific Railways was under consideration in connection with the proposed merging of the Canadian wireless and cable systems into a single unit.—*Reuter* (New York).

One company co-operating with, and on the same basis as, Imperial and International Communications, Ltd., of Great Britain, has been discussed by Sir Basil Blackett, chairman of the British merger, with the Federal Cabinet at Ottawa. Sir Basil proposed that the Canadian Pacific and Canadian National telegraph and cable systems, together with the Canadian Marconi system, should become "partners" with Imperial Communications, Ltd., and at the end of the conference he said: "I have no reason to be dissatisfied with its result." The discussions will be continued after Sir Basil's return from a brief visit to Bermuda. Canada is being asked to become a partner in a semi-governmental communications company as a first step towards co-operation between the Dominions, following action in Great Britain.—*Reuter* (Ottawa).

Hawaiian Islands.—TRANSPACIFIC TELEPHONY.—The success of an ultra-short-wave radio-telephone experiment between the four islands of the Hawaiian group has been so marked that a permanent service is to be established, which is to be followed by the linking-up of the group with the transpacific radio-telephone system. Later communication will be established with North and South America, Australia, New Zealand, and with Europe. Honolulu, on the island of Oahu, will be the station from which the transpacific connection will be established. The three other islands are Kauai, Maui, and Hawaii.

Japan.—TELEPHONY.—The Japanese Government is about to transfer the management of the commercial side of the national telephone system to private hands. Hitherto the entire service has been managed by the State, and the transference is a preliminary to an intensive ten-years' campaign during which every method of commercial salesmanship will be employed to increase the number of telephones in use by half-a-million. One important step will be the abolition of the installation fee, a very high one in Japan, the only exception being a fee for specially urgent installations. The Ministry of Communication will continue to own the exchanges.

A similar transfer of the management of the telegraph service is also being considered.

Morocco.—NEW RADIO STATION.—A 7-kW short-wave radio transmitter is being erected in Morocco for communicating with France, where the transmitter will be at St. Assise and the receiver at Villecresnes.

Telegraphy.—NEW DISTRIBUTING METHOD.—Imperial and International Communications, Ltd., announce that their research staff has pased for commercial use a system whereby cablegrams dispatched direct to South America (Rio de Janeiro and Buenos Aires) pass automatically and instantaneously through all the intermediate stations. Cablegrams may now be continuously transmitted direct from London to the important South American capital with dependability throughout the whole twenty-four hours. Messages for different destinations can be sent over the same cable to a point of bifurcation, whence automatic distribution over branch cables at different speeds is mechanically effected.

The Telephone Service.—TRUNK CALLS.—An increase of 11,559 in the number of inland trunk calls during August, 1930 (the latest month for which statistics are available), is recorded, as compared with the same month in the previous year; the total reached 9,856,822.

"CRADLE" INSTRUMENTS.—The number of telephones in the London area has been more than doubled in the past ten years. There are now more than 700,000 in use in the area, whereas, at the beginning of 1921 the total was 334,000. The micro-telephone (the new cradle hand-set) is becoming increasingly popular, and about 40 per cent. of new orders is for them; approximately 12,700 have already been provided in the London area and the quarterly extra charge for them has been halved

Radio Notes.

Algeria.—NEW STATION.—It is intended to obtain credit for two million francs for the transfer of the Rabat station to Bouznika, says *World-Radio*; its power will be increased to 20 kW and an underground cable will connect the new transmitter with Rabat and Casablanca.

Australia.—FINANCE.—The Postmaster-General announces that £70,000, the balance of the Postal Department's share of listerners' licence fees, after all charges to date have been paid, has been diverted to general revenue. The financial depression has caused a drastic curtailment of the schemes proposed eighteen months ago, when the Commonwealth Government took control of the service. Listeners' fees were to have paid for 16 new relay stations, but, as the erection of all but four has been postponed indefinitely, and the Government needs money, the amount in hand has been devoted to other purposes.

Canada. — LEGISLATION. — The Minister of Marine has announced that no more stations will be allowed to be opened or extended, and no new licences will be granted, till legislation has been introduced during the next session of Parliament. Applications for licences have been so numerous that the Government may be compelled to enforce legislation, says *World-Radio*, as was recommended by the Aird Committee two years ago. A treaty with the U.S.A. is tentatively talked of.

The Times reports that a Radio League delegation has urged upon the Minister of Marine the desirability of the establishment of a national company to be administered by a voluntary directorate which would own and operate six powerful stations reaching every section of the Dominion, and thus neutralise to some extent the virtual monopoly now enjoyed by numerous high-powered stations in the United States. Of 96 broadcasting stations in North America, Canada is only allocated six wavelengths exclusively, and shares the wavelengths of six others; but there is constant interference with the latter, and the chaos has been aggravated by the licensing during 1930 of 16 high-powered stations in Mexico which use wave-lengths allocated to Canada.

RECEIVING SETS.—An official report shows that at the end of November, 1930, there were 444,676 licenced radio sets in Canada, or about one for every 22 of the population. The total is 20,530 higher than the number of radio sets licenced by the Canadian Department of Marine at the end of the fiscal year, March 31st, 1930. Ontario leads among the Provinces with 228,480 sets, then comes Quebec with 81,033, followed by British Columbia with 36,904; Manitoba with 27,929, Saskatchewan with 25,921; Alberta with 19,445; Nova Scotia with 14,052; New Brunswick with 9,746; Prince Edward Island with 1,053, and north-west territories with 113. Toronto leads all Canadian cities with 71,143 sets.—*Reuter* (Ottawa).

Denmark.—INTERFERENCE LAW.—The Minister of Public Works has laid before Parliament a Bill which will prohibit electrical apparatus of all kinds interfering with the radio service.

Germany.—LICENCES.—The number of subscribers to the broadcasting service on January 1st, 1931, is reported as 3,509,509.

WOODEN MASTS.—Berlin's new radio station is to have two towers, each 328 feet high. They are to be erected shortly in the western part of the city and will be constructed of wood entirely like those of the station at Muhlacker, since the absence of metal materially reduces atmospherics. The aerials will be of the "basket" type, which increases the sending area without taking up too much space.—*Reuter* (Berlin).

Licences.—LAST YEAR'S INCREASE.—At the end of December, 1930, the number of receiving licences issued had reached the total of 3,411,910, including 19,460 issued free to the blind. The increase during the year was 455,174, compared with increases of 326,448 during 1929 and of 230,598 during 1928. During December, 1930, the total rose by 85,012.

Wire Recording.—B.B.C. SYSTEM.—The British Broadcasting Corporation is reported to have acquired recording apparatus by means of which items broadcast can be recorded on a thin wire while it is passed at a constant speed between electro-magnets. When the wire is made to re-traverse the gap in the reverse direction the speech and music is reproduced. The system is to be used to a limited extent, it having possibilities in connection with Empire broadcasts, sections of which programmes would have to be delayed on account of time difference.

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below

Contracts Open.

Argentina.—BUENOS AIRES.—February 16th. Argentine National Sanitation Works Department. Water supply and drainage works, involving the supply of underground cable, generating sets, &c. (G.X. 10,002.)*

Australia.—MELBOURNE.—Posts and Telegraphs Department February 10th Telephonists' telephones for common battery working. (A.X. 10569.)*
February 17th. Electric lamps, lamp caps and sockets for voltages from 4 to 50. (A.X. 10643.)*
February 24th. Resistances in vitreous spools ranging from 100 to 4,000 ohms. (A.X. 10642.)*
March 17th. 80 miles of rubber-insulated, cotton-covered twisted conductors. (A.X. 10697.)*

Bridlington.—February 2nd. Town Council. Electrical installation in the new municipal offices. (January 16th.)

Cheadle and Gatley.—February 10th. Electricity Department. General supplies for twelve months. (January 16th.)
Transformer and switch kiosk, a 6,600-V truck cubicle, and e.h.p. cable. (See this issue.)

Chile.—SANTIAGO.—March 10th. Port Works Department. Ministry of Marine. Three electric slewing and travelling cranes, with portal for the Port of Iquique. (A.X. 10,740.)*

Devon.—February 3rd. County Council. Automatic traffic-control signals. (See this issue.)

Dundee.—February 11th. Electricity Department. 4-ton, overhead, travelling hand crane. (January 9th.)

Egypt. — CAIRO. — February 23rd. Ministry of Public Works. Generating, distributing, and pumping plant for Naga Hamadi barrage. (A.X. 10664.)*
SAMANOND.—February 28th. Ministry of the Interior. Supply and installation of an electrical distribution system for the town. (A.X. 10659.)*

Farnworth.—February 9th. Electricity Department. L.p. cable. (See this issue.)

Fife.—January 27th. Electric lighting at Kelty housing scheme (80 houses). Schedules, &c., from Mr. H. F. Hodge, Commercial Bank Buildings, High Street, Dunfermline; offers to County Clerk, County Buildings, Cupar.
January 28th. County Council. Electrical work at Lumphinnans housing scheme. Schedules from Mr. W. Williamson, architect, Kirkcaldy (deposit £1 1s.); tenders to County Clerk.

Hastings.—February 10th. Electricity Department. General supplies for twelve months. (January 16th.)

Hull.—February 16th. Electricity Department. Electrically-operated sluice valves (42 in. and 48 in.). Mr. J. N. Waite, city electrical engineer, electricity works, Sculcoates Lane (deposit £2).

Ilford.—February 9th. Electricity Department. Rectifier and switchboards. (See this issue.)

London.—COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—February 9th. Main, auxiliary and multi-core cables and accessories for connections between the new and existing switch houses at Barking power station. (January 9th.)
CENTRAL ELECTRICITY BOARD.—February 2nd. 132,000-V transformers. (January 2nd.)
February 9th. Construction of site works, foundation works and buildings at Wigan and Southport in connection with the North-West England and North Wales Electricity Scheme. (January 9th.)
February 16th. 66,000-V and other cables in connection with the North-East England Electricity Scheme. (January 16th.)
March 2nd. Central indication and telephone equipments in connection with the South-East England Electricity Scheme. (January 16th.)
OFFICE OF WORKS.—January 27th. Wiring of residences and road lamp standards at Broadmoor Asylum, Crowthorne, Berks. (January 9th.)
January 30th. Electrically-driven sewing machines at Joyce Green Hospital, Dartford. (January 9th.)
February 2nd. Electrically-driven exhaust propeller fans and centrifugal blowing fan sets, &c.; also girders, steel joists, &c. Wiring and fittings for electric lighting at five casual wards. Wiring and fittings for electric lighting in tenement dwellings at Clapham. (January 16th.)
SOUTHWARK.—February 4th. Borough Council. Motor convertors, battery booster, and switchboards. (See this issue.)
L.C.C.—February 10th. Wiring and fittings for electric lighting for public staircases in tenement buildings in Stepney and Poplar. (See this issue.)

New Zealand.—WELLINGTON.—Public Works Department. February 24th. One set of 110-kVA outdoor switchgear, steel-work and controlling equipment. (A.X. 10507.)*
March 17th. 11,000-V switchgear and metering equipment for controlling a 15,000-kVA sub-station. (A.X. 10719.)*
April 14th. Four single-phase 110-kV transformers. (A.X. 10721.)*
Post and Telegraph Department. March 3rd. Carbon diaphragms for telephone instruments. (A.X. 10720.)*

Northern Ireland.—BELFAST.—February 14th. Electricity Department. Steam boiler plant. (January 9th.)

Norwich.—January 30th. Electricity Department. E.h.p overhead lines and switchgear. (January 16th.)

Portsmouth. — February 2nd. Tramways Department. General stores for twelve months. (January 9th.)
Electricity Department. Water-tube boilers, with economisers, steel bunker, and steel building. (January 16th.)
January 30th. H.p. and l.p. cables. (See this issue.)

Plymouth.—February 14th. Corporation. Meters, time switches, cables, transformers and e.h.p. switchgear. (See this issue.)

South Africa.—PRETORIA.—March 13th. Town Council. Condensing plant and auxiliary apparatus for one or two large turbo-alternators. (G.X. 10,001.)*
JOHANNESBURG.—Railways and Harbours. February 2nd. Two 150-kW convertors. (A.X. 10668.)*
February 16th. Material for colour light railway signalling. (A.X. 10662.)*
DURBAN.—February 20th. Corporation. Traffic control signals. (A.X. 10687.)*
CAPE TOWN.—February 4th. City Electricity Department. 50 miles of insulated wire. (A.X. 10714.)*

Smethwick.—January 31st. Education Committee. Low-pressure water heating at the Holly Lodge High School. (January 2nd.)

Staffordshire.—February 3rd. Education Committee. Installation of electric lighting in several school buildings. (January 2nd.)

Tilbury.—February 2nd. Urban District Council. Installation of electric lighting and power and connecting-up of motors and control gear at refuse destructor. (January 16th.)

Wolverhampton. — JOHN THOMPSON (WOLVERHAMPTON), LTD. Turbo-alternators, with condensing plant, pumps, &c. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Ampthill.—Rural District Council. Accepted:—
Installation of electric lighting and heating at Steppingley isolation hospital (£196).—W. F. Hunt.

Bradford.—Tramways Committee. Accepted:—
100 steel tram tires (£328).—English Steel Corporation, Ltd.
Electricity Committee. Accepted:—
Erection of interior cooling stacks at Valley Road power station.—Davenport Engineering Co., Ltd.

Douglas (I.O.M.).—Electricity Committee. Accepted:—
Kiosk with 50-kVA transformer (£139).—Yorkshire Switchgear & Engineering Co., Ltd.
Circulating pump motor (£64).—Lancashire Dynamo and Motor Co., Ltd.

Dorchester.—Housing Committee. Recommended:—
Installation of electric light in houses on Victoria Park housing estate (£147).—Jewell & Norcombe.

East Ham.—Health Committee. Accepted:—
Strowger telephone system at isolation hospital (£190).—Automatic Telephone Manufacturing Co., Ltd.

Farnham.—Urban District Council. Accepted :—
Transformers for the pumping station (£716).—Johnson and Phillips, Ltd.

Glossop.—Hospital Committee. Accepted :—
Internal telephones, Wood's Hospital.—New System Private Telephones, Ltd.

Leeds.—Electricity Committee. Accepted :—
Cables.—W. T. Henley's Telegraph Works Co., Ltd. (£1,201); Enfield Cable Works, Ltd. (£2,671); Macintosh Cable Co., Ltd. (£365); Metropolitan Electric Cable and Construction Co., Ltd. (£1,679); Derby Cables, Ltd. (£2,011).

London. — ISLINGTON. — Electricity Committee. Recommended :—
Installations under rental and hire-purchase wiring schemes, for 12 months.—E. H. Finn.
Lead battery for refuse collection vehicle (£146).—D.P. Battery Co., Ltd.
ST. MARYLEBONE.—Electricity Committee. Recommended :—
Grit arrestors with fans, &c. (£8,765).—Pneumatic Conveyance and Extraction (1929), Ltd.

Staffs.—County Council. Accepted :—
Electrical installation at the new offices (£644).—W. Hampton.

York.—Electricity Committee. Accepted :—
Duplicate transformer (£1,457).—Metropolitan-Vickers Electrical Co., Ltd.

Forthcoming Events.

Birmingham Electric Club.—Friday, January 23rd. Grand Hotel, Birmingham. 7 p.m. Presidential address.

Leicester Association of Engineers.—Friday, January 23rd. College of Technology, Leicester. 7.30 p.m. "The Application of Electricity in the Heat Treatment of Steel." Mr. A. Glynne Lobley.

Junior Institution of Engineers.—Friday, January 23rd. Institution, London. 7.30 p.m. "The Progress and Development of Steam Generators." Mr. E. W. Thompson.

Institution of Electrical Engineers.—Monday, January 26th. Institution, London. 7 p.m. Informal meeting. Discussion on "Reliable Fractional Horse-power Motors for Commercial Purposes." Opened by Mr. L. Murphy.

(London Students' Section).—Friday, January 23rd. Institution, London. 6.15 p.m. Short papers. Saturday, January 24th. 2.30 p.m. Visit to Mycalex (Parent) Co., Ltd., Acton Lane, N.W.

(North-Eastern Centre).—Monday, January 26th. Armstrong College, Newcastle-upon-Tyne. 7 p.m. "The Medical and Surgical Applications of Electricity." Mr. B. Leggett.

(North-Midland Centre).—Tuesday, January 27th Hotel Metropole, Leeds. 7 p.m. Informal discussion on "The Oil-immersed Circuit Breaker." Opened by Mr. C. S. T. Paul.

(North-Western Centre).—Tuesday, January 27th. College of Technology, Manchester. 7 p.m. "Loud-speakers since their Conception with Gramophone Pick-ups and Wireless Recording Apparatus," by Mr. S. G. Brown. To be delivered by Major C. A. Russell Stower.

(South Midland Centre).—Wednesday, January 28th. Central Technical College, Birmingham. 7 p.m. Faraday lecture. "The Birth of Electrical Engineering." Prof. W. Cramp.

(North-Eastern Students' Section).—Wednesday, January 28th. Armstrong College, Newcastle-upon-Tyne. 7.15 p.m. Joint meeting with the Graduates of the North-East Coast Institution of Engineers and Shipbuilders. "Diesel Electric Vehicles for Railway Service." Mr. B. Reed. Saturday, January 31st. Joint visit with the N.E.C. Graduates to Vickers-Armstrong Elswick Works, Newcastle-upon-Tyne.

(West Wales (Swansea) Sub-Centre).—Friday, January 30th. Corporation Electricity Showrooms, Swansea. 6 p.m. "The Electrical High-pressure Testing of Cables and the Localisation of Faults." Mr. J. Urmston.

Royal Institution.—Tuesday, January 27th. Institution, London. 5.15 p.m. "Art of Illumination." Mr. J. W. T. Walsh.

Institution of Civil Engineers.—Tuesday, January 27th. Institution, London. 6 p.m. "The Strength of Arc-welded Joints." Mr. F. R. Freeman.

Electrical Power Engineers' Association (London Local Group).—Tuesday, January 27th. Junior Institution of Engineers, London. "Automatic Boiler House Control." Mr. W. G. Thomas.

Electrical Contractors' Association.—Wednesday, January 28th. Savoy Hotel, London. 6.30 p.m. for 7 p.m. Annual dinner.

Edinburgh Electrical Society.—Wednesday, January 28th. 16, Royal Terrace, Edinburgh. "Industrial Electric Heating." Mr. V. O. Cutts.

Institution of Welding Engineers (North-Western Branch).—Thursday, January 29th. Engineers' Club, Manchester. 7 p.m. "The Use of Pure Iron Electrodes for Welding Cast Iron." Messrs. H. D. Lloyd and J. S. G. Primrose.

Electroplaters' and Depositors' Technical Society.—Friday, January 30th. Lyon's Corner House, Islington, N. First annual dinner.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We shall be glad to learn the names and addresses of makers of the following devices :—

Soft iron wire 5/32 in. diameter for small electro-magnets. Inquirer has not yet succeeded in securing suitable material. Rapid action and absence of residual magnetism essential.

Vase shaped table standards in bakelite.

Notes.

The Batti-Wallahs.

At the luncheon of the Batti-Wallahs' Society which is to be held at the Hotel Metropole on Thursday, February 5th, at one o'clock, Alderman W. Walker, M.I.E.E., M.I.Mech.E., will address the members and guests on "Labour Conditions in the Electricity Supply Industry." The annual dinner and dance will be held at the same hotel on Friday, March 20th.

A Power Station "Improvement Class."

The name of the lecturer mentioned in the note in our last issue bearing the above title (p. 114) should have been given as Mr. Vernon Walker and not as stated.

Panel-heater Plaster Work.

Tests have been completed of a successful attempt to satisfactorily fix plaster to concrete faces. The popularity of panel heating has drawn additional attention to this acute problem, as the effect of heat increases the possibility of plaster ceilings, &c., becoming detached from the main building fabric. After experimenting with double tapered bevel-edged rubber strip, which has been named the "Ke-it" unit, it is officially reported by the Dunlop Rubber Co., Ltd., that the device gives an additional safety factor of at least twenty to plaster ceilings. When laid on concrete centreing or form-work the device creates an undercut void which makes an efficient hanging medium for the plaster coat. It remains effective in spite of shrinking and affords a new degree of safety in buildings in which vibration caused by organs or electrical reproducing apparatus tends to loosen the plaster work.

Illuminating Engineers' Dinner.

We have been informed that the Illuminating Engineering Society is to hold its annual dinner, which will be followed by dancing, on Tuesday, February 10th, at the Trocadero Restaurant, London.

Appointments Vacant.

Assistant lecturer for Faraday House Electrical Engineering College.

Two shift engineers for the Hong-Kong Electric Co., Ltd.

Technical assistant and wayleave assistant for the West Midlands Joint Electricity Authority.

(See our advertisement pages to-day.)

Small Circuit-breakers.

At a recent meeting of members of the Paisley Association of Electrical Engineers, Mr. H. Aberdein presiding, Mr. T. T. D. Geesin delivered a lecture on "Circuit-breaker *versus* Fuse Protection" for low-voltage distribution. The fuse had long outstayed its welcome and the small circuit breaker had not made its appearance a day too soon. He pointed out the disadvantages of the fuse as the only means of protection by quoting the inconvenience caused in public buildings, factories, restaurants, &c., due to a blown fuse, and then described an original small circuit breaker as being simple to operate; above all, it could not be closed on a persistent fault, nor could it be held in under fault conditions. The original pattern was fitted with a simple magnetic release without time-lag features, but with the introduction of gasfilled lamps it was found necessary to extend its utility by the addition of a time-lag device.

Electric Parcels-delivery Trucks.

Reference has been made in these columns to the fact that, whereas in this country electric industrial trucks are mainly used in factories, docks, railway stations and goods yards, they are on the Continent, particularly in Germany, very largely employed for ordinary goods transport purposes, the vehicles taking their place in the ordinary modern street and road

traffic. Of the varied uses to which such vehicles are being put, yet another example is their adoption by the parcels post section of the German postal service for the delivery of packages in the Berlin area. As a result of extensive trials it has been found that electric industrial trucks are well suited to the purpose, inasmuch as their day's mileage can be well defined, consisting of a journey from the main parcels post office to one or other postal divisions of the German capital, being practically a house-to-house delivery, necessitating frequent starts and stops of the vehicle. As a result of the tests the postal authorities have recently put into service a fleet of electric trucks of 2-ton capacity, supplied by the Allgemeine Electricitäts Gesellschaft, of Berlin. The vehicles are fitted with van bodies and enclosed driver's seats. Two types of bodywork are in use, one having doors on each side and one with large double doors at the rear. In both cases a roof rail is provided, so that large parcels can be carried on the van top, access thereto being obtained by a light steel ladder fitted at the rear. Behind the driver's seat is also a small compartment with a special lock for the storage of registered parcels. The chassis portion of the trucks is of the maker's standard type, there being two small electric motors connected to the rear axle through enclosed gearing, the necessary power being supplied by a battery of accumulators suspended under the centre of the chassis in such a way that when necessary the battery case can be drawn out laterally. The controller, which is located at the driver's left, is adapted to give three forward and two reverse speeds and has also an electric braking position. The rear wheels are also provided with internal-expanding brakes operated by either foot or hand levers, the arrangement being such that whenever the mechanical brake is applied the current supply to the motors is automatically cut off. The road wheels are of the detachable steel-disk type shod with 23 by 5 in. or 25 by 6 in. pneumatic tires. On the level the vans, with a full load, can attain a speed of 12½ m.p.h., while when empty they can travel at 15 m.p.h. Among the advantages claimed for them is their relatively low first cost and subsequent maintenance and low running costs. Another strong point put forward in their favour is that, owing to their relatively small dimensions, they cause very little hindrance to traffic by their frequent stops for parcels delivery, this being a point of importance in relatively narrow thoroughfares.

Fatalities.

An inquest was held at Sherburn Hill, near Durham, on January 13th on Mrs. Margaret Annie Adair, who received a fatal electric shock while carrying out her duties as caretaker at the local picture hall. She was found on the floor clutching an electric radiator. Mr. L. Vickers, head electrician at Sherburn Hill Colliery, said the radiator was of an old-fashioned type, and he was of opinion that Mrs. Adair lifted it at the top and put her other hand underneath it, possibly catching the terminals. A formal verdict was returned.

At an inquest which was held on January 13th on John Stanley Gorst, of Astley, who received a 230-V shock, evidence was given that he was trying to cut an electric wire with a pair of uninsulated pliers, standing on a concrete floor. A representative of the local power company said that had Gorst been standing on a wood floor probably the shock would not have been fatal. A verdict of "Death from Misadventure" was returned.

Atmospheric Electricity.

The German High-voltage Research Society, which has for some time been conducting research work on lightning discharges on the summit of Monte Generoso on the Swiss-Italian frontier, is now arranging to carry out further work in connection with atmospheric electrical discharges in the Breslau district of Germany.

"Baa! Baa! Black Sheep."

In accordance with the announcements published in the ELECTRICAL REVIEW recently, a performance of "Baa! Baa! Black Sheep" (by P. G. Wodehouse and Ian Hay) was given on January 14th at the New Scala Theatre (London, W.) by the Bouverie Players.

The services of the caste and of the Fleet Street Orchestra (conducted by Mr. N. V. Dagg) were, of course, entirely voluntary, so the whole proceeds, after the deduction of expenses for the hire of the hall and similar items, will be available for the funds of the Electrical Trades Benevolent Institution. By way of a prologue Mr. Gordon Robbins gave a short address, in which he stated that it was expected, as a result of the evening's entertainment, to hand over to Mr. Chattock a sum exceeding £200. (We understand that the actual amount is about £220.) He also mentioned that the play had been given on the two previous nights for other benevolent purposes.

Mr. R. A. Chattock followed with an announcement that the funds of the Institution now totalled about £50,000, which was available to give assistance or to provide pensions to those in need. £100,000 was required, however, to safeguard the position.

The play is classed in the curiously named category of "farcical comedy." If the element signified by the first part of the title proved the stronger, that was all to the good in promoting a jolly evening.

The brunt was borne by Mr. Gordon Grieve as "Hugo Bonsar." He was absent from the stage for very few moments during the evening, and with Miss Doris Lewin, as "Chickie Buff," who had nearly as strenuous a time, delighted the audience of 700 or so without intermission, judging by the loudly expressed tokens of pleasure. It was a few minutes before one realised the full electrical significance of Miss Lewin's fancy-dress costume. An Acknowledgment made in the programme then immediately recalled "beauty enriched by light."

While we are unable in the space at our disposal to criticise each of the 13 other members of the caste (exclusive of "John William" and "Ada Ann") we may say that these provided most competent support to the two named. We think we might mention, however, that one young actress, who gave a convincing performance of "the modern girl," did not make the most of a good stage presence owing to her tendency to stoop. We mention this because its easy avoidance would enhance the effect of her acting.

Large Electric Smelting Furnaces.

The Siemens and Halske Co., of Berlin, has lately completed to the order of the Soviet Russian Government several large electric furnaces for the metal-smelting works at Chelialinsk. The plant supplied comprises three ferro-silicon furnaces, each having a capacity of 7,800 kVA, two 1,300-kVA ferro-chrome furnaces, and one 1,300-kVA ferro-wolfram furnace. The ferro-silicon furnaces are of the fixed type, while the others are fitted with tipping mechanism for pouring and slag-removing purposes. Electricity for the furnaces is being supplied from an 11,000-V, 50-period, a.c. distribution network.

Talking Marine Beacon.

The Gramophone Co., Ltd., announces, by the courtesy of the Clyde Lighthouse Trustees, that for many months it has been engaged upon experimental work in connection with the talking beacon at Cumbrae. The local announcements made from the lighthouse are reproduced from "His Master's Voice" records designed specially for the work. The whole success of this development depends upon exact synchronism between all parts of the apparatus, and very exact recording and record-pressing work were demanded. The idea was conceived by Mr. Charles A. Stevenson, of the Clyde Lighthouses Trust, to overcome the fact that the atmospheric conditions when fog prevails in many cases make a correct estimation by a ship of the direction and distance from which a fog warning is being heard very difficult. Mr. Stevenson's invention makes it possible to ascertain accurately the exact distance to the source of the warning in the following manner. Simultaneously with the usual fog hooter a small radio transmitter sends out a series of signals, preceded by the name of the lighthouse, reproduced from one of the special records. The mariner, listening on a simple radio receiver, hears the radio announcement of the name of the lighthouse and a series of counted figures representing cable-lengths and miles. So very much more rapid is the radio signal than the air-borne sound of the fog hooter that there is a perceptible time interval between receiving the radio signals and hearing the hooter, and this has made it possible to calculate by the time interval the distance from the lighthouse.

The radio part of the equipment was furnished by the Mullard Wireless Service Co., Ltd., and operates on a wavelength of 1,044 metres, of 40 watts capacity.

French Electrically-propelled Ship.

The French shipping line has ordered from the Penhost shipyards at St. Nazaire what is declared will be the largest and fastest electrically-propelled ship in the world. She is to be used on the transatlantic service, will be delivered in the spring of 1934, and her speed will be over 30 knots. The ship will be over 1,000 ft. long, will have four propellers, and will be driven by electric motors developing at least 160,000 h.p. Power is to be provided by four turbo-generators fed with superheated steam by 30 water-tube Penhost boilers operating at a pressure of 450 lb. per sq. in.

A Bulk Supply Scheme.

In the note under the above heading in our last issue, referring to the inauguration of the supply to Ballymena, Northern Ireland, the ownership of the Curran Point, Larne, generating station was attributed to the Antrim Electricity Supply Co., Ltd. We are now informed that actually this station is the property of the Larne Electric Light & Power Co., Ltd.

Institution of Electrical Engineers.

INFORMAL MEETING.—At the informal meeting on January 12th Mr. W. E. Bradshaw was in the chair, when Mr. J. F. Shipley opened a discussion on "The Packing and Transport of Electrical and Allied Machinery." A number of lantern slides illustrated problems of transport in unusual situations, and his remarks were mainly upon the tremendous difficulties of overcoming the ill-usage and rough handling inevitable in remote and inaccessible places. The packer and his foreman, though their responsibility was large, were not classed as engineers. They often ranked as unskilled labour, working by commonsense and rule of thumb. There were no English text-book and few journals devoted to the packers' craft, though a German, Dr. Ing. E. Sacksenberg, and an American, Mr. F. J. Keeley, had published admirable and elaborate studies. Apart from goods lost without trace, the damage in transit must cost exporters an enormous sum. It might be said if one wished to ensure safe arrival, make the package difficult and cumbersome to handle and it would then receive what skilful treatment was available; packages of standard dimensions got indifferent and careless treatment.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. **E. Isherwood,** who was for 27 years superintendent electrical engineer with Messrs. Nobel's Explosives Co., Ltd., will in future devote his time wholly to consulting work. He has been presented with a pair of easy chairs by the members of the staff, and two pairs of silver entrée dishes by the employés of the electrical department.

Mr. **Charles Holden,** on January 20th, received on behalf of his firm, Messrs. Adams, Holden & Pearson, the London architecture medal and diploma for 1929 in respect of the new headquarters of the London "Underground" group at Westminster.

Mr. **A. McKinstry,** a director of the Metropolitan-Vickers Electrical Co., Ltd., has been appointed to the board of Babcock and Wilcox, Ltd.

M. Desarces, chief engineer of the Compagnie Parisienne de Distribution d'Electricité, has been appointed a Chevalier of the French Legion of Honour.

Mr. J. Sigfrid Edstrom, who recently attained the age of 60 years, is regarded (writes a correspondent) as one of Sweden's captains of industry. In 1903 he was appointed managing director of the Swedish General Electric Co.—"A.S.E.A." The concern was founded in 1883, largely on the inventions of the great Swedish electrical engineer, Jonas Wenstrom, but the economic outlook was, nevertheless, overclouded at that time. Much of the credit for its present position is attributed to Mr. Edstrom and his staff.

Mr. G. V. Underwood is relinquishing the position of mains engineer to the Welwyn Garden City Electricity Supply Co., upon his appointment as electrical engineer to Staverton Builders, Ltd., Totnes, Devon. Mr. Underwood has been presented by his colleagues at Welwyn with a mahogany striking clock.

Mr. Leo E. Harris has relinquished the position of managing director of Ringsdorff Carbons (England), Ltd., of Hendon, which position he has held for some years. Members of the trade who may be interested can communicate with him at present at 7, Shirehall Gardens, Hendon, N.W.4.

Sir James Lithgow, Bt., has been nominated for a second year's term as president of the Federation of British Industries. Sir James recently resigned from the Central Electricity Board on account of the pressure of other duties. **Sir Arthur Duckham,** G.B.E., is recommended for election as deputy-president for the ensuing year with a view to his succeeding Sir James Lithgow as president in 1932. Sir Arthur Duckham was chairman of the British Economic Mission to Australia in 1929.

Sir Leonard J. Milburn has been elected to the board of the Newcastle and District Electric Lighting Co., Ltd. Sir Leonard's father, Sir John Milburn, was the first chairman of the company.

The Times reports that **Sir Roland Nugent,** director of the Federation of British Industries, has been granted leave of absence on account of ill-health, and will be away until Easter. **Mr. G. Locock** has been appointed acting director during his absence.

Mr. Bernard Price, O.B.E., general manager and chief engineer in South Africa to the Victoria Falls and Transvaal Power Co., Ltd., has been appointed to the board of the company.

Mr. H. B. Keeping, F.C.A., has resigned from the position of secretary to the National Joint Board for Employers and Members of Staff (Electricity Supply Industry) on account of the increase in his professional work.

Mr. A. H. Banks, who has for the past 12 years held the position of employers' secretary to the North-Western District Council and District Board, has been appointed to the following positions: Industrial adviser to the employers' side of the National Joint Industrial Council, secretary to the employers' side of the National Joint Board, and joint secretary (with Mr. W. A. Jones) to the National Joint Board. The business of the combined offices will be conducted from 2, Mount Street, Manchester.

Obituary.

Mr. C. B. Smith.—We learn with regret that Mr. Charles B. Smith, engineer and manager of the Hove Corporation electricity undertaking, died suddenly on January 18th. Mr. Smith became an associate member of the Institution of Electrical Engineers in 1893 and had been a member since 1898. The funeral was to take place at Putney Vale Cemetery yesterday (Thursday).

Mr. H. W. Woods.—We regret to record the death, which occurred at his residence at Surbiton, on January 13th, after a short illness, of Mr. Harry William Woods, managing director of the Thames Electric Co., Ltd., electrical contractors, &c., of Kingston-on-Thames. Mr. Woods was 50 years of age; his health was undermined through service in India during the war.

Mr. T. C. Bush.—The death took place on January 16th, at the age of 78 years, of Mr. Thomas C. Bush, founder and head of the firm of Messrs. H. L. Bush & Co., electrical engineers, Wells Road, Bath. He established the business at the age of 23 years. The business is being carried on by a son, Mr. Hubert Bush, and Mr. W. James. From the age of 12 for 64 years he was organist at the chief Nonconformist churches at Bath and conducted the massed choirs. At the Crystal Palace he conducted a choir of 5,000.

M. K. Kando.—The *Daily Telegraph* reports the death, at Budapest, of M. Koloman Kando, general director of the Ganz Electricity Works, and the inventor of a well-known electric locomotive system.

Wills.—The late **Dr. Daniel Adamson,** proprietor of Joseph Adamson & Co., boilermakers and engineers, Hyde, Cheshire, left estate valued at £64,775 (£62,273 net personalty).

The late **Mr. Hugh H. MacTaggart,** of Messrs. MacTaggart, Scott & Co., Ltd., left personal estate in Great Britain valued at £22,934.

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares.

New Companies Registered.

J. A. Jones, Ltd.—Private company. Registered January 16th. Capital, £100 in £1 shares. Objects: To carry on the business of wholesale and retail wireless and electrical instrument manufacturers, general merchants, &c. The permanent directors are: D. A. Jones (chairman), 10, Farm Avenue, Cricklewood, wireless dealer, and J. Hyman. Solicitors: W. R. Bennett & Co., 74, Great Russell Street, W.C.1.

British Blattnerphone (Stille System), Ltd.—Private company. Registered January 14th. Capital, £30,000 in 29,757 "A" ordinary shares of £1 and 2,430 "B" ordinary shares of 2s. each. Objects: To acquire and turn to account the rights, privileges and benefits in respect of and concerning certain inventions of Dr. C. Stille, proposed to be granted by deed of sub-licence between Stille Inventions, Ltd., of the first part, Electro-Magnetic Controls, Ltd., of the second part, and the company of the third part, to adopt an agreement with Electro-Magnetic Controls, Ltd., and to carry on the business of dealers in, manufacturers of, agents for and licensees of gramophone records, gramophones, sound boxes, amplifiers, kinematograph and other cameras, instruments, television, telephone, electrical and wireless apparatus, &c. The subscribers are: A. MacGregor, 80, Ashburton Avenue, Croydon, accountant; H. A. Turner 159, Railton Road, Herne Hill, S.E.24, clerk. Registered office: 35/36, Little Newport Street, W.C.2.

Radiofans, Ltd.—Private company. Registered January 12th. Capital, £600 in £1 shares. Objects: To carry on the business of manufacturers and repairers of, agents for, and dealers in instruments, apparatus, accessories and materials

used in connection with radio-telegraphy, telephony, television and photography, &c. The first directors are: C. S. Jones, "Windrive," Chester Road, Heswall, Ches.; G. L. Jones, "Inglewood," Moss Lane, Timperley, Ches. Secretary: C. S. Jones. Registered office: 48, Castle Street, Liverpool.

Imanex, Ltd.—Private company. Registered January 10th. Capital, £500 in £1 shares. Objects: To acquire the business carried on by Capt. J. Brown and Mrs. M. Brown at 5, Central Buildings, High Street, Slough, Bucks, as the "Lisenin Wireless Co." The subscribers are: Capt. J. Brown, "The Hollies," North Park, Iver, Bucks.; E. Meyer, 114, Sutherland Avenue, Maida Vale, W.9, merchant. Secretary: E. Meyer. Registered office: 5, Central Buildings, High Street, Slough, Bucks.

Yorkshire Electrical Agency, Ltd.—Private company. Registered January 12th. Capital, £500 in £1 shares. Objects: To acquire the business of a dealer in electrical and wireless apparatus now carried on by W. N. Tagg at 31, Norfolk Lane, Sheffield. The subscribers are:—W. N. Tagg, 33, Carlton Road, Sheffield, electrical engineer; A. E. Sadler, 66, Bushey Wood Road, Totley, Sheffield. Solicitors: J. W. Fenoughty, Ashton and Company, 7, Bank Street, Sheffield.

Paris & Partners (Engineers), Ltd.—Private company. Registered January 10th. Capital, £1,000 in £1 shares. Objects: To adopt an agreement with R. A. MacMahon, E. J. Hall and M. W. Hall, to develop and turn to account the business of general engineers referred to therein, and to carry on the business of electrical engineers, manufacturers of motor cars and spare parts, &c. The first directors are: R. A. MacMahon, 158, Stonhouse Road, Clapham, S.W.4, electrical engineer; and E. J. Hall and M. W. Hall, 16, Grange Road, Clapham. S.W.4, engineers. Secretary: Mrs. M. J. MacMahon. Registered office: 158, Stonhouse Road, Clapham, S.W.4.

B. & J. Wireless, Ltd.—Private company. Registered January 14th. Capital, £1,000 in £1 shares. Objects: To acquire the business of a wireless component manufacturer, carried on by H. A. A. Brosse as the B. & J. Wireless Co., at 2 and 3, Athelstane Mews, Finsbury Park, N. The permanent directors are: H. A. A. Brosse, 104, Barrington Road, N.8, manufacturer; A. P. Knightbridge, Luthers, Wickford, Essex, salesman.

Willis Radio, Ltd.—Private company. Registered January 15th. Capital, £100 in £1 shares. Objects: To carry on business as engineers, advisers, and contractors in connection with wireless telephony or telegraphy, &c. The subscribers are: R. H. Currell, 79, Scotts Road, Leyton, E.10, and W. H. Young, 64, Fairfax Road, Leytonstone, E.11. Secretary: M. Marks, 65-66, Basinghall Street, E.C.

Bell Moulding Co., Ltd.—Private company. Registered January 9th. Capital, £2,000 in £1 shares (1,200 "A" ordinary and 800 "B" ordinary). Objects: To acquire the business carried on at 857, High Road, Tottenham, N.17, as The Bell Moulding Company, and to carry on the business of manufacturers of, dealers in, and agents for, all kinds of synthetic resins and allied compositions, bakelite and similar materials and substances, moulders, pressers, stampers and shapers, cabinet makers, manufacturers of, agents for, and dealers in, wireless goods and accessories. The directors are: E. C. Bell, 38, Victoria Road, Edmonton, N.18, engineer; R. V. Grover, 44, Holden Road, Woodside Park, N.12.

Official Returns of Electrical Companies.

Berkeley Electrical Engineering Co., Ltd.—Capital, £15,000 in £1 shares. Return dated November 20th, 1930. 9,000 shares taken up. £9,000 paid. Mortgages and charges, nil.

Atlas Electric & General Trust, Ltd.—Capital, £6,500,000 in 3,000,000 preference, 3,000,000 ordinary, and 500,000 unclassified shares of £1 each. Return dated November 20th, 1930. All the preference and ordinary shares taken up. £1,749,078 paid on 1,214,189 preference and 534,889 ordinary shares, £4,250,922 considered as paid on 1,785,811 preference and 2,465,111 ordinary shares. Mortgages and charges: £750,000.

H. A. Lee, Ltd.—Capital, £1,500 in £1 shares. Return dated October 25th, 1930. 1,350 shares taken up. £550 paid, £800 considered as paid. Mortgages and charges, nil.

Loewe Radio Co., Ltd.—Capital, £100 in £1 shares. Return dated October 22nd, 1930. 50 shares taken up. £50 paid. Mortgages and charges, nil.

Nelson Electric Co., Ltd.—G. H. Robinson, 95a, Chancery Lane, W.C.2, ceased to act as receiver and/or manager on December 31st, 1930.

Hanson & Hanson, Ltd.—Particulars filed of £1,600 debentures authorised November 18th, 1930, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Rowland Edwards & Co., Ltd.—Satisfaction (1) in full on May 21st, 1930, of debenture dated June 12th, 1928, for £500 and registered June 15th, 1928, and (2) to the extent of £100 on May 21st, and to the extent of the balance of £500 on December 3rd, 1930, of debenture dated November 30th, 1925, for £600 and registered December 3rd, 1925.

Sevenoaks & District Electricity Co., Ltd.—Satisfaction in full on September 1st, 1930, of £50,000 first mortgage debentures (without trust deed) authorised by resolutions of November 25th, 1914, June 15th, 1920, and October 14th, 1921, and registered March 20th, 1915, July 30th, 1920, and November 10th, 1921. (Notice filed January 7th, 1931.)

Ultra Electric, Ltd.—Capital, £5,000 in £1 shares. Return dated December 15th, 1930. All shares taken up. £3,000 paid. £2,000 considered as paid. Mortgages and charges, nil.

Norman Radio, Ltd.—Capital, £1,000 in £1 shares. Return dated October 8th, 1930. All shares taken up. £400 (8s. per share) paid. Mortgages and charges, nil.

E. Mercer, Ltd.—Capital, £2,000 in £1 shares. Return dated October 2nd, 1930. 1,502 shares taken up. £2 paid. £1,500 considered as paid. Mortgages and charges, nil.

Stearn Electric Co., Ltd.—Capital, £4,000 in £1 shares. Return dated November 26th, 1930. All shares taken up. £2 paid. £3,998 considered as paid. Mortgages and charges, £9,700.

Highgate Cable & Engineering Co., Ltd.—Capital, £1,000 in £1 shares. Return dated November 22nd, 1929 (filed November 26th, 1930). 600 shares taken up. £600 paid. Mortgages and charges, nil.

Newhaven & Seaford Electricity Co., Ltd.—Capital, £5,000 in £1 shares. Return dated June 25th, 1930. All shares taken up. £5,000 paid. Mortgages and charges, nil.

Electric Sign Co., Ltd.—Capital, £5,000 in £1 shares. Return dated October 17th, 1930. 2,000 shares taken up. £1,000 paid. £1,000 considered as paid. Mortgages and charges, nil.

Oxford Radio Supplies, Ltd.—Capital, £1,500 in £1 shares. Return dated October 20th, 1930. 1,400 shares taken up. £1,400 paid. Mortgages and charges, nil.

English Electric Co., Ltd.—Satisfaction in full (1) on November 7th and 14th, 1930, of deed of security (mortgage or charge) dated September 15th, 1924, and registered September 18th, 1924; and (2) on November 7th, 1930, of charge dated October 23rd, 1928 (supplemental to charge dated September 15th, 1924) and registered October 24th, 1928).

City Notes.

Westinghouse Brake & Saxby Signal Co., Ltd.

The annual meeting was held on January 16th, Lord Southborough presiding in the absence of the chairman, Mr. J. W. Cloud. After referring with regret to the death of Mr. J. H. Luke and Mr. S. P. Wood, directors, the chairman presented the accounts (ELECTRICAL REVIEW, January 9th, p. 73) and said in the course of his speech that during the year under review they had received an increased volume of orders for their railway products. Their rectifier business had again increased so much that the volume was about double; it was largely due to this important branch that they had been able to maintain their profits at the present level. The current year marked the 50th anniversary of the company, which was founded in 1881 by the late Mr. George Westinghouse, the inventor and pioneer of air pressure brakes. Capt. B. H. Peters, in seconding the resolution for the adoption of the report and accounts, said that the Westinghouse electro-pneumatic brake had been fully developed and had now been adopted by the London Electric Railways; several trains were already equipped with this system, while many others were being fitted. The system had also been adopted for the electric railways in Sydney, N.S.W. While the use of the brakes on freight wagons had not yet become general in this country, the company was closely associated with the development of brakes for freight vehicles in many other countries, and was in an excellent position when the time came to fully meet the requirements of the English railways. The Westinghouse metal rectifier was constantly being developed and brought into use in new fields. The extension of the national grid system of electricity supply was rapidly extending the use of a.c. There were, however, many electrical devices which either required or operated more satisfactorily on d.c., and their rectifier provided a simple means of conversion from a.c. to

d.c. Their entrance with the rectifier into the radio field had been most successful, but there were many other uses for which they supplied these rectifiers, and the growth of their business in larger sets for commercial purposes was now very satisfactory. The report and accounts were adopted.

London Power Co., Ltd.

On Monday last this company offered for subscription £3,000,000 of 5 per cent. redeemable debenture stock at £100 10s. per cent. and the issue was immediately over-subscribed. The prospectus set out the constitution of the company under the London Electricity (No. 2) Act of 1925 and mentioned that the capital expenditure on the completed stations operated by the ten constituent companies, together with those under construction, the main transmission system, and sub-station plant amounts to £14,000,000. The present installed capacity of the plant is 595,580 kW, and when the stations under construction are completed the figure will be raised to 1,000,000 kW. The company has paid a dividend of 6 per cent. in each of the past three years. The proceeds of the issue are to be devoted to the extension of the company's business, in particular for the first section of the new selected station at Battersea; to meet the obligations of the company under certain contracts; and for the general purposes of the company. The stock is redeemable at par on October 1st, 1972, but the company reserves the right to redeem all or part at three months' notice on or after October 1st, 1952.

Adelaide Electric Supply Co., Ltd.

The report for the year ended August 31st last shows a gross revenue of £834,032, as compared with £839,156 in the preceding year. Operating expenses and taxes totalled £389,809, leaving a net revenue of £444,213 (against £450,724). After writing off the cost of debenture stock issued in Adelaide in October, 1929, and £3,562 off the cost of London issue in April, 1930, and providing for interest, &c., there is a balance of £313,970, to which is added £32,030 brought in. General reserve receives £72,000 (£90,00) and contingency reserve £15,000 (same). A final dividend of 6 per cent. is paid on the ordinary stock, making 12 per cent. for the year (same), and £31,500 is carried forward.

Brazilian Traction, Light & Power Co., Ltd.

The directors have issued a notice stating that in view of the continued unsettled business and financial conditions in Brazil and elsewhere, and in order to maintain a sound cash position, they have decided that it is in the best interests of the company and its shareholders to declare a stock dividend for the current quarter. Accordingly a stock dividend is declared on the ordinary shares of no par value at the rate of one fully-paid share for each 50 fully-paid shares held by holders of record January 31st.

Associated Gas & Electric Co.

The net earnings for the year ended October 31st last were $49,614,314, an increase of 3.2 per cent. as compared with the preceding year. The earnings, it is stated, cover the annual requirements on the company's funded debt and the funded debt and preferred stocks of its subsidiaries over 2.3 times. The sales of electricity and gas for domestic purposes have shown increases sufficient to offset the decrease in the sales to industrial consumers.

Crompton Parkinson, Ltd.

The directors have declared an interim dividend of 11¼ per cent. on the 750,000 5s. ordinary shares, in respect of the year to June 30th next. This distribution is at the same rate as last year, but on an increased capital, as the 150,000 5s. "A" ordinary shares, issued in September last, now rank for dividend.

Anglo-American Telegraph Co., Ltd.

A final dividend of 1½ per cent. has been declared on the ordinary and preferred ordinary stocks, making 3¾ per cent. and 6 per cent., respectively, for 1930, and a first and final dividend of 1½ per cent. on the deferred ordinary stock for the year.

Marco Refrigerators (1929), Ltd.

It is proposed to delete the "1929" from the company's title, and an extraordinary meeting has been called for February 10th to approve this step.

Allen-Liversidge, Ltd.

An interim dividend is announced on the ordinary shares, on account of the eight months ended December 31st last, of 3 per cent. (actual), less tax.

Herbert Morris, Ltd.

An interim dividend is announced of 3 per cent., less tax, on the 6 per cent. cumulative preference and 2¼ per cent., tax free, on the 5 per cent. cumulative preference shares.

Delhi Electric Supply & Traction Co., Ltd.

An interim dividend is announced of 4 per cent., less tax (same).

Yorktown (Camberley) Gas & Electricity Co.

The gross profit for the past year was £19,298, against £15,662 in 1929. After meeting interest and preference dividend the directors proposed to pay a dividend of 6¼ per cent. on the consolidated ordinary shares, leaving £12,536 (against £10,430) to be carried forward.

Electrolytic Zinc Co. of Australasia, Ltd.

The directors have announced their decision to defer consideration of the payment of a dividend on the cumulative participating preference shares until the close of the current financial year.

Stocks and Shares.

TUESDAY EVENING.

THE reassembling of Parliament on Tuesday in this week was not expected to have much effect upon Stock Exchange markets. In the ordinary way, anticipation looks forward without enthusiasm to a new Parliamentary session, it being a matter of experience that legislation is apt, on the whole, to create more disturbance than peace in the financial world. The outstanding feature continues to be the strength of purely investment stocks, the area of choice in which has lately been curtailed by the apprehension caused in connection with Australian stocks, most of which come within the Trustee list, owing to the unhappy conditions into which Australian credit and business have fallen. The consequence is that the money which flows towards Safety First stocks is eschewing anything Australian, and its owners are employing the capital in other directions. This should have a good effect upon such stocks as those of the Central Electricity Board, and of the London and Home Counties J.E.A., both of which recently offered 4½ per cent. debenture stock at 95¼. The price of the fully-paid scrip, as our tables show, has declined to the price of issue.

London Power Issue Success.

The London Power Company has been offering 3 million pounds of 5 per cent. redeemable debenture stock at 100¼, of which 30¼ per cent. will be paid by January 29th, 30 per cent. on February 23rd, and the balance of 40 per cent. on January 16th. The first interest-payment will fall due on October 1st, for the full half year's amount of £2 10s. per cent. The stock, when fully paid, will rank, *pari passu*, with the existing 5 per cent. debenture stock, the price of which is 103, and which carries nearly four months' interest due on May 1st next. The price asked for the new issue is tolerably high, but the subscription-lists closed within five minutes of their having opened.

It may be noticed that the London Electric, the Metropolitan District, and the City and South London Railways have deposited a Bill framed with the object of conferring further Parliamentary powers on the companies. It is not proposed to take any additional capital powers. Amongst other matters in contemplation, the Bill mentions the construction of seven new subways, together with the enlargement and alteration of certain stations. Prices of the Tube companies' issues are steady.

Electricity Supply.

Changes in the prices of the Home Electricity Supply companies include rises of 6d. in South Londons to 27s. 6d., and Kensingtons to 28s. 6d. Chelseas drooped to 27s. 6d. Amongst the provincial issues, Lancashire Light and Power has again eased off, the price giving way to 24s. No further information has become available up to the time this was written concerning the Egham and Staines rumours. These suggested that the company was to be taken over on a basis that would give the ordinary shares 45s., and, although a little profit-taking reduced the price to 37s., the latter quickly recovered to 40s. Richmond (Surrey) keep good at 44s. Northamptons are quoted at 45s.; Isle of Thanet weakened to 25s., the preference being about threepence lower than this.

Victoria Falls ordinary shares have moved up to 58s. 9d. Perak Hydro-Electric 7 per cent. debenture stock is down 20 points, to 55, on the announcement that current earnings are insufficient to meet the debenture and loan interest. Delhi Electric Supply is to pay an interim dividend of 4 per cent.—the same as a year ago.

Conferences on Electrical Development.

Conferences are being held this week in Glasgow, Manchester and London to press forward the Government's plan for the cheap supply of electricity to every part of Great Britain. The conferences have been arranged by the Minister of Transport, Mr. Herbert Morrison, and further meetings are in contemplation. As noted here at due dates, the Central Electricity Board has been making substantial issues of new capital with which to provide the money necessary to carry out the progressive programme that the Board has in view. The contracts given out last year came to about 10 million pounds sterling. Stock Exchange estimates look to this amount being very considerably exceeded during the current twelve months. If so, the obvious inference is that further issues of capital may be anticipated.

Cables and Wireless.

Cables and Wireless 5½ per cent. preference is 3 lower at 65½, and the 7½ per cent. "A" ordinary stock at 20½ has lost 2 points. The market in the stocks is dull and lifeless, nor is it thought that any particular hope of improvement can be entertained until some definite indication appears of increased trade. The Government has been denounced in no measured terms for its reckness extravagance, and its inability to foresee the result of prodigal spending. But for all that, no brake is applied to wastefulness, and until there is some change in this direction it is difficult to see from what direction encouragement to improved trade is likely to come. The news from America with regard to industry in that Continent is of mixed description, and, from the point of view of Stock Exchange prices, the fluctuations are not sufficiently upwards on balance to warrant the assumption that confidence feels any too happy, either in the United States or in Canada.

Telephones and Marconi's.

American Telephone and Telegraph at 187½ is 2½ points down, and Internationals at 23½ retain the gain which they secured last week. Marconi Marines have gone back a florin, to 37s. 6d. At this price, the yield on the money, on the basis of the present-paid 15 per cent. dividend, comes to 8 per cent. Automatic Telephones have dropped to 36s. 3d. There has been a little business in United River Plate Telephones on the basis of 4¾. Great Northern Telegraphs at 29½ are 10s. down.

Manufacturing Shares.

The market in shares of the manufacturing and equipment companies is mainly dull. There are falls in Henley's at 5¾, Callender's at 3¼, British Insulated at 3 3/16, and Enfields at 4¼. No special reason can be given for the heaviness that has crept into the prices in this group. The declines may be deemed to be no more than a reflection of the depression through which the whole world is passing, and of which the electrical equipment companies will no doubt have to accept their share.

The home trade in these companies is probably suffering less than that of a great many other branches of industry, and holders of shares in the companies have reason to congratulate themselves upon the manner in which profits keep up. On the other hand, export business is perhaps falling off, and, in addition to this, competition from abroad is keener than ever. The best companies are managed on lines so sound that the actual dividends distributed are well below the ratio of actual profit earned on the ordinary shares. This constitutes in itself a dividend equalisation fund, and any year would have to be indeed a bad one for the distributions to be materially cut.

Miscellaneous Matters.

English Electric preference have gone back to 8s. 9d., an anomalous price in view of the fact that the ordinary shares of the company are left at 10s. On neither class is any dividend being paid. The debit balance shown in 1927 of £321,000 was reduced in 1929 to £67,200. Crompton Parkinson have declared an interim dividend of 11¼ per cent., actual, on the ordinary shares, being at the same rate as that of last year. The capital has been, however, increased during the interval. For the whole of 1930 the company paid 30 per cent. on its ordinary shares of 5s. each, and the yield on the current price of 21s. 3d., assuming the 30 per cent. to be repeated, is a little over 7 per cent. Associated Electrical Industries ordinary, after being down to a pound, recovered to a guinea. G.E.C. ordinary are a trifle easier at 44s. 6d. The feature amongst engineering shares is a fall of 3/16 in Babcock & Wilcox, which has lowered the price to 45s. The cause of the decline has been selling, mainly from the North.

Stock on Offer.

Yorkshire Electric Power 5 per cent. debenture can be bought as to £5,000 stock at 104½, which includes the half-year's interest payable on May 1st next. Service of the interest calls for £25,527. The net revenue for 1929 was £368,000. Redemption can be effected from May 1st, 1941, at 102, and for ten years aftereafter. In the next decade, the stock can be repaid at 101, and after 1961 at 100.

Pirelli-General Cable 5½ per cent. debenture has the unconditional guarantee jointly and severally as to principal, premium and interest, of the General Electric Co., Ltd., and the Italian Pirelli Company, in addition to being a specific charge on certain freehold and leasehold properties. There is £5,000 stock offered at 105½. The debenture is redeemable at 100, on or before July, 1965, by the operation of a cumulative sinking fund. The company has the right to repay the whole issue at any time up to and including July 1st, 1935, at 105, with accrued interest, and at any time thereafter at 102, with accrued interest, on giving three months' notice.

Dollar Stocks.

The market for dollar securities is irregular, but on the whole shows a disposition to dulness. As exceptions, Hydro-Electrics are better at 24, and Barcelona Tractions at 23. No change worth mentioning has occurred in British Columbia Power "A" shares at 36¾, or in the "B" at 12¼. "Sofinettes" have gone back to 38s. 9d. Shawinigan Water at 52 show a fall of a dollar. Power Corporation of Canada shares are ½ down. Brazilian Tractions shaded off to 23. Mexico Trams are dull at 10½; the 5 per cent. bonds have lost 4 points at 58.

Share List of Electrical Companies.

	Nom.	Approx. Dividend. 1928.	1929.	Price Jan. 30 1931.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.						
	£					
Bournemouth and Poole	1	15	15	3 1/16	—	4 17 10
Brompton Ordinary	1	8½	8½	27/6	—	5 1 10
Central Electricity 4½% Deb.	Stock	—	—	95½	—¼	4 14 3
Charing Cross Ordinary	1	8½	8½	29/-	—	4 16 7
Chelsea	1	8⅝	8⅝	27/6	—6d.	5 1 10
City of London	1	10	10	36/3	—	5 10 3
Clyde Valley	1	8	8	34/6	—	4 12 9
County of London	1	7	10	48/9	—	4 2 0
Edmundsons' 7% Pref.	1	7	7	25/6	—	5 9 10
Elec. Supply Corporation	1	11	11	48/9	—	4 11 0
Kensington Ordinary	1	8	8	28/6	+6d.	4 18 3
Lancs. Light and Power	1	7½	7	24/-	—6d.	5 16 8
London & Home Counties 4½% Deb.	Stock	—	—	95½	—¼	4 14 3
London Electric	1	8½	9	32/6	—	5 10 9
Metropolitan	1	9	10	42/-	—	4 15 3
Midland Counties	1	6½	7	28/6	—	4 18 3
Mid. Elec. Power	1	15	8	31/3	—	5 2 5
Newcastle-on-Tyne Ordinary	1	6	6	24/6	—	4 18 0
do. 7% Pref.	1	7	7	27/6	—	5 1 10
Notting Hill 6% Pref.	10	6	6	11½	—	5 6 8
North Met. Elec. 6% Pref.	1	6	6	24/-	—	5 0 0
St. James' and Pall Mall	1	8	8	28/-	—	5 0 0
Scottish Power	1	8	8	30/-	—	5 6 8
South London	1	8½	8½	27/6	+6d.	5 1 10
Urban Ordinary	1	7	7	29/6	—	4 15 0
Westminster Ordinary	1	8½	8½	29/-	—	4 16 7
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	25/6	—	5 17 8
Yorkshire Elec.	1	8	8	34/6	—	4 12 9
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	79	—	5 0 9
Metropolitan	,,	3½	4	67	—	5 19 5
do. District	,	4	5	77	—	6 9 10
Underground Electric	£1	7	8	24/6	—	6 10 8
do. do. Income	Bonds	6	6	104	—	5 15 5
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	103½	—	5 16 7
do. Def.	,,	1½	1½	26	—	5 15 5
Automatic Telephone	1	10	12½	36/3	—¼	6 18 1
Cables & Wireless 5½% Pref.	Stock	—	5½	65½	—3	8 8 0
do. A 7½% Ord.	,,	—	—	20½	—2	... ...
do. B Ord.	,,	—	—	10	—2	... ...
Globe Tel. and T. Ord.	10	10	10	13xd	—	7 13 10
do. do. Pref.	10	6	6	10½	—¼	5 13 0
Great Northern Tel.	10	20	£0	29½	—¼	6 15 7
Marconi-Marine	1	12½	15	37/6	—2/-	8 0 0
Oriental Telephone Ord.	1	12	12	28	—	*5 1 1
HOME AND FOREIGN TRAMS, &c						
Anglo-Arg. Trams First Pref.	5	5½	5½	12	—	... ...
do. do. 2nd Pref.	5	6	6	17/6	—	... ...
do. do. 5% Deb.	Stock	5	5	50	—2½	10 0 0
British Electric Traction Def. Ord.	,,	5	5	1325	—	... ...
do. do. Pref. Ord.	,,	8	8	132½	—	6 0 9
Brazil Traction	100	7	8	23	—1	... ...
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	96½	—	5 3 7
London & Sub. Trac. 5% Pref.	1	Nil	Nil	11/6	—	... ...
London United Tram Deb.	Stock	4	4	57½	+1	6 19 2
Mexico Trams, 5% Bonds	—	5	5	58	—4	8 12 4
Mexican Light Common	100	Nil	Nil	42½	—	... ...
do. 7% Pref.	100	7	7	64½	—	10 17 0
do. 1st Bonds	—	5	5	80	—	6 5 0
Victoria Falls Ord.	1	15	15	58/9	+9d.	5 2 0
Yorkshire (West Riding)		Nil	Nil	5/6	—	... ...
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	6	6	21/-	—	5 14 3
Babcock & Wilcox	1	13	15	2½	—3/0	*6 13 4
British Aluminium Ord.	1	10	10	30/-	—	6 13 4
British Insulated Ord.	1	15	15	3 3/16	—1/16	4 14 1
Brush Ord.	Stock	10	10	105	—	9 10 6
Callenders	1	15	15	3½	—⅛	4 17 1
do. 6½% Pref.	1	6½	6½	25/-	—	5 4 0
Crompton Parkinson Ord.	5/-	—	30	21/3	—	7 1 2
do. 8% Pref.	1	8	8	26/3	—	6 2 0
Edison-Swan 1st Pref.	1	7½	7½	23/9	—	6 6 4
do. 5% Deb.	Stock	5	5	92½xd	—	5 8 1
Electric Construction	1	5½	5	12/-	—	8 6 8
Enfield Cable Ord.	1	20	25	4½	—¼	5 17 8
English Electric	1	Nil	Nil	10/-	—	... ...
do. do. Pref.	1	3	Nil	8/9	—⅛	... ...
Ferranti Pref.	1	7	7	21/6	—	6 10 4
G.E.C. Pref.	1	6½	6½	25/6	—	5 2 0
do. Ord.	1	10	14	44/6	- 6d.	6 5 10
Henley	1	25	30	5¾	—¼	5 4 6
do. 4½% Pref.	5	4½	4½	4¾	—	5 2 10
India-Rubber	1	Nil	Nil	6/3	—	... ...
Johnson & Phillips	1	10	10	36/9	—	5 8 10
Siemens Ord.	1	7½	7½	1 1/16	—	7 1 2
Telegraph Construction	12	10	10	16½	—	*7 5 6

*Dividends paid free of Income Tax.

Our Overseas Electrical Trade.

A Survey of Exports and Imports During 1930.

WITH the publication of the December trade returns we are able to make a survey of the general course of electrical import and export trade during the past year. Dealing first with the figures for last month, we show in the first table that the export total was slightly below that of November, and considerably lower than the December, 1929, figure. In the comparison with November the largest decrease (£53,309) occurred in the case of telegraph and telephone instruments and apparatus, while railway and tramway motor exports fell by £30,250. Apart from these there were only two other decreases, all other items being higher on the month, particularly insulated wires and cables, and submarine cables. The chief contribution to the fall of £371,666 as compared with December, 1929, was made by telegraph and telephone instruments and apparatus; in fact, the telegraph and telephone section as a whole registered a decline of £186,763—about half of the total decrease. In spite of a rise of £13,218 in the exports of unenumerated electrical machinery, the machinery exports as a whole were £41,168 lower.

Imports during December were substantially higher than in the preceding month, although they failed to reach the December, 1929, level. Electrical machinery was mainly responsible for the rise, but telegraph and telephone apparatus, and insulated wires and cables contributed largely. The decline from the total of the corresponding month of 1929 was chiefly due to smaller imports of meters and instruments, while glow lamp imports also fell considerably. On the other hand, the imports of telegraph and telephone apparatus rose by £70,178.

The re-exports made a further advance, and as will be seen from Table III, they were £296,069, or about 86 per cent , greater in value than in 1929.

Table I.—Exports and Imports during December, 1930.

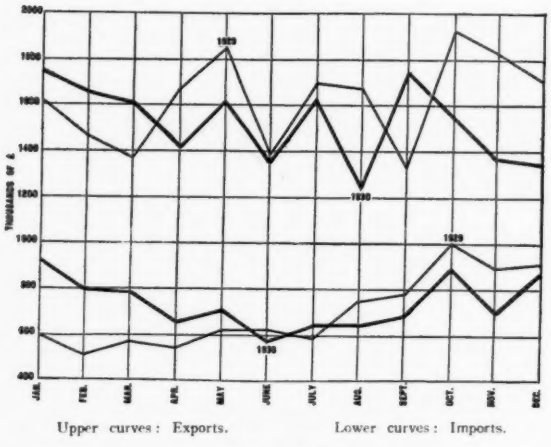
	Exports.			Imports.			Re-Exports.		
	Electrical exports for Dec., 1930.	Inc. or dec. as compared with Nov., 1930.	Inc. or dec. as compared with Dec., 1929.	Electrical imports for Dec., 1930.	Inc. or dec. as compared with Nov., 1930.	Inc. or dec. as compared with Dec., 1929.	Electrical re-exports for Dec., 1930.	Inc. or dec. as compared with Nov., 1930.	Inc. or dec as compared with Dec., 1929.
Electrical goods and apparatus (unenumerated)	£236,387	+ £6,038	— £40,116	£196,634	+ £13,078	+ £2,263	£15,577	+ £5,382	+ £1,636
Insulated wires and cables ...	195,072	+ 17,602	— 85,713	84,081	+ 23,157	— 8,022	559	— 458	+ 149
Glow lamps	36,775	+ 252	— 19,934	51,191	+ 1,823	— 35,007	540	+ 105	— 476
Arc lamps and parts	2,283	+ 1,439	+ 133	4,583	+ 15	+ 3,063	—	— 14	— 55
Batteries and accumulators ...	72,476	+ 11,803	— 1,569	79,911	+ 2,530	+ 3,926	739	— 1,849	+ 150
Meters and instruments ...	25,772	— 5,312	— 2,509	40,155	— 26,450	— 102,409	3,278	— 5,648	+ 2,916
Carbons	1,844	+ 1,140	+ 1,339	18,934	+ 2,003	+ 7,651	36	— 38	+ 14
Switchboards (not telegraph or telephone)	9,208	+ 2,200	+ 4,634	132	— 95	— 110	—	— 4	— 14
Electrical Machinery—									
Electrical machinery (unenumerated)	291,673	— 5,907	+ 13,218	192,742	+ 86,584	+ 1,287	12,241	— 2,355	+ 81
Railway and tramway motors	12,960	— 30,250	— 3,876	—	—	—	—	—	—
Other motors and generators...	192,116	+ 8,029	— 50,510	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	53,111	+ 2,374	— 45,106	9,288	+ 6,735	+ 7,848	101	+ 48	+ 101
Submarine telegraph and telephone cable	29,768	+ 16,816	— 54,572	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	180,769	— 53,309	— 87,085	183,960	+ 53,033	+ 70,178	20,428	+ 13,232	+ 16,943
Totals...	£1,340,214	— £57,185	— £371,666	£861,611	+ £162,413	— £49,932	£53,499	+ £8,401	+ £21,445

Table II.—Exports of Electrical Machinery.

Destination.	Weights. 1930. Tons.	Weights. 1929. Tons.		Inc. or dec. Tons.	Values. 1929. £	Values. 1930. £		Inc. or dec. £
European Countries	6,081	7,920	+	1,839	1,268,722	1,429,111	+	160,389
Japan	1,395	615	—	780	232,257	103,091	—	129,166
South America	2,996	4,543	+	1,547	497,234	733,649	+	236,415
South Africa	3,295	3,642	+	347	511,236	501,023	—	10,213
British India	8,749	6,698	—	2,051	1,386,760	1,066,472	—	320,288
Australia	6,349	5,216	—	1,133	931,511	731,810	—	199,701
New Zealand	1,704	2,763	+	1,059	245,662	379,427	+	133,765
Canada	2,154	3,119	+	965	309,575	377,285	+	67,710
Other Countries	6,252	6,663	+	411	964,584	1,012,608	+	48,024
Totals	38,975	41,179	+	2,204	£6,347,541	£6,334,476	—	£13,065

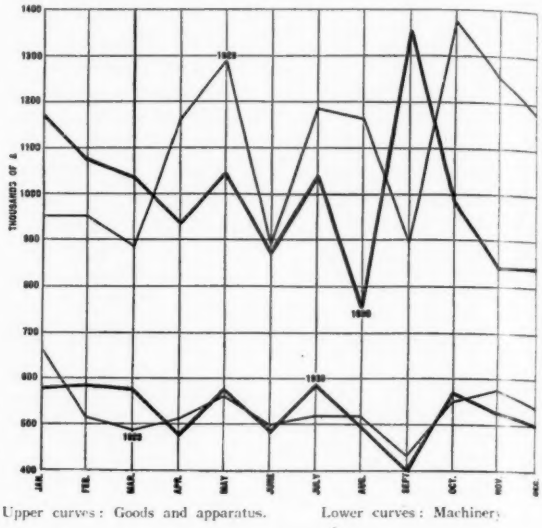
Turning now to the totals for the year we would first remind readers that there was a considerable fall in prices during the year and this must have had some effect upon the import and export values. It would be extremely difficult, if not impossible, to assess this effect, in so far as the electrical trade is concerned, with any degree of accuracy. It can only be pointed out that the average wholesale prices of all commodities fell by about 12 per cent. during 1930. Coal prices, however, declined by only 2½ per cent. and iron and steel prices by less than that. On the other hand, "other metals and minerals" showed a decrease of over 18 per cent.

The decline in the total value of electrical exports in



Upper curves: Exports. Lower curves: Imports.

Fig. 1.—Monthly Electrical Exports and Imports.



Upper curves: Goods and apparatus. Lower curves: Machinery

Fig. 2.—An Analysis of Electrical Exports.

1930 as compared with 1929 amounted to 6.4 per cent., so it seems safe to assume that the actual volume of trade was at least about on the 1929 level. As will be seen later, this was certainly the case with electrical machinery in which while the value fell the volume rose. The decrease in exports was general, only three items having increases recorded against them—unenumerated machinery, submarine telegraph and telephone cable, and switchboards. The fall in exports of insulated wires and cables was very heavy, amounting to about 14 per cent.; a decrease of similar proportions also occurred in the case of telegraph and telephone instruments and apparatus. No doubt the break in copper prices last year was responsible for a great part of the fall in the value of exported cables. Batteries and accumulator exports also showed a substantial decline in value.

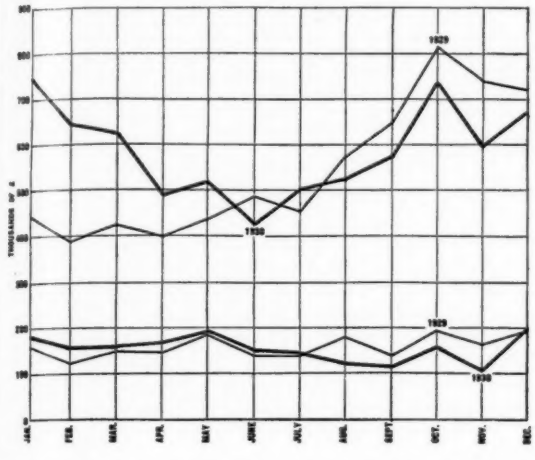
The exports of electrical machinery during the past two years are dealt with separately in Table II. As we have pointed out, although the volume increased there was a decline in the total value. The unit value fell from £163 per ton in 1929 to £154 per ton in 1930—or 5.5 per cent. The decrease in Japan's share was not unexpected in view of the development of that country's home production, but the serious fall shown against India is a different matter. The increasing electrical activity in India should provide more work for the British electrical industry, in spite of political conditions. The economic condition of Australia, coupled with the imposition of higher and higher duties, is sufficient explanation of the smaller exports to the Commonwealth. South Africa's share of the trade remained at the 1929 level. The increases are of a gratifying character as they were all achieved in what are generally regarded as difficult markets. Europe became our best customer for electrical machinery, while India sank to second place, with an increase of about 12 per cent. An even better

Table III.—Exports and Imports during 1929 and 1930.

	Exports.			Imports.			Re-Exports.		
	1929.	1930.	Inc. or dec.	1929.	1930.	Inc. or dec.	1929	1930.	Inc. or dec.
Electrical goods and apparatus (unenumerated)	£3,224,345	£3,015,851 —	£208,494	£1,877,643	£1,828,530	— £49,113	£110,440	£151,815	+ £41,375
Insulated wires and cables ...	3.394,0 9	2,915,586 —	478,453	914.652	932.685	+ 18.033	9 487	6,987	— 2,500
Glow lamps	662,530	589,356 —	73,174	495 273	559,699	+ 64.426	12,110	10 872	— 1.238
Arc lamps and parts ...	25,398	20,918 —	4.480	24,217	31,946	+ 8 729	649	983	+ 334
Batteries and accumulators ...	1,004,627	890,785 —	113.842	862,249	774,169	— 87,780	11,743	45,173	+ 33 430
Meters and instruments ...	386,596	362,774 —	23,822	568,398	1,474.136	+ 965,738	8,419	62,850	+ 54,431
Carbons	13.090	12,928 —	162	151,081	194.901	+ 43 820	1,750	4.352	+ 2.602
Switchboards (not telegraph or telephone)	64,100	88,787 +	24,687	2,214	1,702	— 512	98	34	— 64
Electrical Machinery—									
Electrical machinery (unenumerated)	3,763,170	3,871,849 +	108.679	1,901.218	1,816.962	— 84,256	125,409	140,967	+ 15 558
Railway and tramway motors	293,801	182,473 —	111,328	—	—	—	—	—	—
Other motors and generators...	2,290,570	2,280,154 —	10,416	—	—	—	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	1,118,179	827,616 —	290.563	46,711	37.719	— 8.992	2.095	403	— 1.692
Submarine telegraph and telephone cable	424,137	802,923 +	378,786	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	2,842,424	2,401,705 —	440,719	1,628,641	1,196,170	— 432,471	62,831	216,664	+ 153.833
Totals	£19,507,006	£18.263,705	—£1,243,301	£8,411,297	£8.848,919	+£437,622	£345,031	£641,100	+£296,069

proportional showing was made by South American countries whose share rose by 47 per cent. and Canada whose figure was higher by 21 per cent.

In spite of the fall in prices during the year, electrical imports again increased. The rise is attributable to meters and instruments, imports of which, as will be



Upper curves: Goods and apparatus. Lower curves: Machinery.

Fig. 3.—An Analysis of Electrical Imports.

seen, were £965,738, or 190 per cent. higher in value. Against this there was a set-off of £432,471 (26 per cent fall) in telegraph and telephone instruments and apparatus. There were also substantial declines in imports of batteries and accumulators and electrical machinery.

We illustrate this article by a series of curves showing the monthly levels of exports and imports. Fig. 1 indicates the total values month by month during the past two years. Dealing first with the upper pair of curves, showing exports, it will be seen that while in 1929 the general tendency was upwards, the reverse was the case in 1930, and the monthly average was about £100,000 lower in the latter year. A low level was reached in August, but this was followed by a rise to the highest point of the year, although this figure was exceeded twice in 1929. During the past year imports (lower curves) gradually declined from the high level reached in 1929, until July when a recovery occurred which continued and maintained the monthly average about £37,000 above that of the preceding year.

Fig. 2 presents an analysis of electrical exports, showing goods and apparatus, and machinery separately. Goods and apparatus being the larger constituent and also being subject to wider fluctuations determine the shape of the total curve. It will be noticed that, in general, the machinery curve follows the other very closely. In September last, however, while goods and apparatus ascended to within a short measure of the highest point of 1929 machinery exports fell to the lowest level recorded since September, 1928. Conversely, while in October machinery exports rose, exports of goods and apparatus fell back to about the average.

In fig. 3 electrical imports are analysed in the same manner. The lower curves show that electrical machinery imports move within very narrow limits; the curves representing the two years are remarkably similar. The predominance of goods and apparatus in the import total make the curve illustrating the monthly totals a reflection of the fluctuations in this section.

The Electric Homes Campaign.

A Review by Mr. V. W. Dale of past results and future activities at the fourth E.D.A. Conference of the 1930-31 Session.

THE fourth E.D.A. Sales Conference of the 1930-31 Session was held at the Royal Society of Arts on January 16th under the chairmanship of **Mr. A. G. Beaver.** The subject presented for discussion was the E.D.A. Electric Homes Campaign, and the proceedings were opened by **Mr. V. W. Dale,** business manager of the Association, who reported on the first section of the Campaign, and gave details of the methods to be employed in the second section, from January to June this year.

As his text Mr. Dale quoted a statement to the effect that only 18 per cent. of the houses in Great Britain were wired, and of these not one in 50 was completely electrified. If British electricity consumption rose to the United States level the annual output would be trebled. He said that the Campaign could only be successful by practical co-operation, which meant better salesmanship and more opportunities for better selling. While many undertakings had fostered the domestic load to compensate for the industrial losses, electrical selling, generally speaking, had not kept pace with progress in other departments of electrical work. But for this there would be an actual boom in domestic electrification. The Campaign required the immediate mobilisation of a bigger sales force, *i.e.*, the provision of staffs and organisation, and publicity commitments to a degree more commensurate with the object of the Campaign, which was to get at least three plug points in every home in every area in which a supply was available. The E.D.A. Council had authorised a national advertising scheme, and the Campaign committee was producing at attractive booklet for national circulation and was active in other directions. But unless this work was supported by the industry it would prove abortive. Money was being spent freely in many directions and being diverted from increasing and improving the amenities of the home. That movement must be counteracted. There was no doubt that the public could afford better electrical facilities. The cost of living had fallen but wages remained higher. Savings had increased and the income tax returns showed higher figures. In one year there were 343,499 marriages; when the public conscience was electrically roused, many home-makers would not be content to start their new life in inadequately-wired houses. Then births numbered 783,052, indicating a good market for heating-plug points, milk warmers and kettles. An average of £25 per annum was spent on alcoholic liquors alone, apart from other "luxury" expenditure. The speaker then dealt with the building of houses. At the last census, he said, there were 9,087,472 houses in Great Britain; between 1922 and 1928 a further 1,156,083 were built. Although electricity was available to at least 70 per cent. of these homes, so far only about 20 per cent. were wired and only 2 per cent. of those were completely electrified. Out of 258,070 houses built during 1928, 194,534 were assessed at £20 and could be considered eligible for attention. While in 1928 £68,200,000 was spent upon gas—largely for domestic purposes, receipts from the sale of electricity totalled £45,300,000. There was accordingly every reason to be optimistic regarding the prospects of a domestic electrification campaign.

Those present at the Conference were particularly interested in the London and Home Counties area. In that area there was a population of 11,861,790, of whom 481,920 were engaged in professional and executive positions and therefore all potential "plug pointers." Another encouraging feature of modern conditions was the growth in the number of owners of cars. Among other figures, Mr. Dale mentioned that the annual expenditure on tobacco and confectionery in the area was £50,000,000. Moreover, the proportion of electricity consumers was rather higher than the average—676,986 out of a population of 7,683,819 accounted for.

The Electric Homes Campaign resembled almost completely in its objects, and to some extent in its methods, the "Red Seal" Campaign which was being carried out in Canada and America. In Toronto the Campaign was said to be responsible for an increase of over $1,000,000 per annum in the volume of business. The speaker exhibited a number of diagrams connected with the "Red Seal" Campaign showing that it had proved an unqualified success from the points of view of the public and the industry.

The E.D.A. Campaign actually started in the autumn of 1929, and last year a special effort towards architects and builders was made. Over 600,000 copies of "The House You Want" had been circulated and the Association had received 4,757 inquiries. A National Home Wiring Specification had been produced and it had received the approval of the whole industry through the E.D.A. Area Committees. The commencement of the second section of the Campaign had been delayed on account of the Area Committees and Circles being fully occupied with the Shop and Display Lighting Campaign, but the ground had been prepared by national advertising.

The programme possessed three cardinal points which it was desired to stress. The first was the organisation of electric homes in which the Association would give practical assistance as well as financial assistance in publicity. Secondly, the subtitle of the Campaign "Three Plug Points" was not to be translated too literally. It was a slogan carrying a definite statement and was preferable to an indefinite phrase such as "More Plug Points." Thirdly, they aimed at disposing of a much greater number of copies of the booklet "Three Plug Points" than the 600,000 copies of "The House You Want." He commended the booklet to the industry as a first-class investment. He interpolated a plea to supply authorities to include one or more plug points in their assisted wiring schemes. If approximately one-half of the existing consumers could be persuaded to install an average of one additional plug point each the value of the additional wiring business would be £1,500,000, while if all new domestic consumers were treated on the same basis there would be a further £500,000 worth of wiring business. The Home Wiring Specification should not be overlooked; the industry should see that every architect and builder had one. In conclusion, Mr. Dale urged his audience to keep in close touch with the Association, and to support their Circles, or form Circles if they did not already exist.

Discussion.

In the ensuing discussion the **Chairman** urged, in the first place, that those engaged in the electrical industry should not be content to leave the whole of the work in connection with the campaign in the hands of the E.D.A., but that all should do their utmost individually to popularise the use of electricity. With regard to the booklet entitled "Three Plug Points" he said that although the matter in the book urged that there should be three plugs in each room, three points must be the minimum; the aim was to have three in every room.

Mr. W. R. Rawlings was not convinced that the slogan "Three Plug Points" was the right one, for it did not roll off the tongue easily, and therefore might not be retained in the minds of the public as well as it was hoped it would be. Further, the word "point" did not really express to the lay mind what was really meant. He confessed to a feeling that it was easier to sell good electrical apparatus than to sell plugs in the first place, and that if the apparatus were sold the plugs must necessarily follow. This led him also to plead for the abolition of the plug adapter; he pointed out that it was sometimes sent out with 600-watt apparatus, which should not be allowed, and he urged that its abolition would do more than any other factor to help the plug campaign.

Mr. N. Madle (Hertford) disagreed with the suggestion that apparatus should be sold first and the plugs afterwards, and pointed out that that was exactly opposite to what actually happened. He emphasised the psychological value of the word "need" in any slogan, and said he would have preferred that the slogan for the forthcoming campaign should have been "You need three plugs."

Mr. G. S. Francis (E.D.A.) emphasised the importance of giving some indication of the sizes of plugs which should be provided. In this connection he recalled a recent occasion on which a man had given a contractor instructions to install 10 plug points in a house which was being built for him, and the contractor had installed all 5-amp. plugs. The contractor had sheltered behind the fact that he had not been given instructions as to sizes of plugs, and presumably he had estimated for 5 amp. plugs throughout with a view to keeping his price low. There should be at least one 15-amp. plug.

Mr. F. W. Howell appealed for more and better salesmen, and urged that their outlook should be positive. He asked all to resolve that they would make a start by persuading at least three of their friends to install three more plug points.

Mr. C. H. Rayner (Manchester) urged upon all supply authorities which had not yet adopted assisted-wiring schemes that such schemes would assist very materially the plug campaign. He agreed with the remarks of Mr. Francis concerning sizes of plugs.

Miss Bryce (Beckenham) testified to the help which some supply companies were giving through the deferred-payment system.

A speaker pointed out that the illustration in the E.D.A. booklet which it was proposed to circulate depicted old-type plugs, and he suggested that it would be better to urge the use of a switch plug, which could be controlled locally. In support of his plea he pointed out that if a consumer connected a heater to the circuit by means of an old-type plug he might see a spark and become frightened, whereas if he used a switch plug he would not see any sparking.

Mr. F. C. Robinson (Sevenoaks) emphasised the necessity for educating the builders and architects particularly with regard to the sizes of plugs required for various purposes.

Miss Kennedy (Women's Engineering Association) instanced a case in which a tumbler switch had been installed immediately above a bath, and said that when the contractor's attention was drawn to it he had replied that he knew of heaps like it. This served to emphasise the need for educating the public with regard to the positioning of switches.

Mr. E. J. Dowson (E.D.A. Area Officer, South Wales and Monmouthshire and South-West Areas) stated that the secretary of one of the builders' associations in the Bristol area had offered to provide a newly-erected house completely decorated and wired for electric lighting and power, to obtain the assistance of a furnisher to furnish it, and to hand it over to any E.D.A. Circle or supply authority as a demonstration house for a period of one, three or six months. He had mentioned six towns in the west country in which a demonstration house could be provided.

Mr. Dain (Leyton), who considered that Mr. Dale had made out a good case for an assisted-wiring plug campaign, said that his undertaking had received 30 applications for assisted wiring during the week, and 25 applicants had asked for a plug for wireless purposes. The fact that consumers asked for plugs for wireless provided a most convincing argument for the installation of more plugs. He complained that in many cases the initial deposits demanded in respect of assisted wiring installations were too high. His undertaking was content with an initial deposit of one-twentieth of the total amount, and had not experienced any financial loss.

Mr. R. Grierson (Messrs. Grierson, Ltd.), in urging that the booklets to be circulated should contain some indication of the rating of the plugs and sockets advocated for various purposes, said that the contractors were being cursed for their shortcomings, but the contractors had to compete one with the other, and perhaps the E.D.A. was partly to blame for not educating the public to ask for what they wanted.

Lieut.-Col. W. A. Vignoles (Director, E.D.A.) replied that the Association had recognised the necessity for educating the public, and he reminded Mr. Grierson that it had produced last year the Electric Home Wiring Specification, in respect of which agreement had been reached by electrical interests throughout the country. That specification was available to any who required it. The book to be circulated to the public during the plug campaign was not intended to be a technical document, but one which would arouse general interest.

Mechanisation of Industry.

Electricity's part in industrial progress.

THE part which electricity is playing and must continue to play to an increasing extent in the mechanisation of industry was told by **Mr. A. P. Young**, manager of the Rugby Works of the British Thomson-Houston Co., Ltd., at a conference on this subject which was held in London on January 16th. The object of the Conference was to discuss the problems associated with the use of more machinery and mechanised methods in industry from the points of view of both management and ownership, on the one hand, and labour on the other. The conference was convened by the Preliminary Committee on Mechanisation and the Conference sub-committee consisted of Mr. R. Pugh (chairman), Mr. D. A. Bremner, Mr. H. W. Burgoine, Mr. W. Meakin, Dr. G. H. Miles, Mr. A. Morgan, Mr. A. Parker, Mr. H. C. Weston and Mr. S. Townsend, secretary, 68, Victoria Street, S.W.1. It is recognised even by labour leaders that mechanical methods must come into play more and more in industry and employers frankly admit that there must be a temporary displacement of labour and an increase of unemployment. On the other hand, there are those who argue that the work found in producing the mechanical methods for introduction into industry will offset to a large extent the unemployment caused by the installation of this machinery in industry, and that ultimately the production of cheap goods must mean employment. At the same time there is some force in the point of view that it is little comfort to a man discharged say in the textile or any other industry to be told that because of the machines which have been made to displace him, some other men have been found employment. Put briefly, to take the trade union point of view first, as revealed at the Conference, the position taken up is that the mechanisation of industry is inevitable and must go on. Indeed, the trade union leaders, in their travels abroad, have had it forced upon them that the engineering and shipbuilding industries in other countries are proceeding along these lines to an even greater extent than we are in this country, and that if we are to hold our own we must do the same. But what, they ask, is to be done for labour displaced by machines and for which no other employment can be found immediately, pending the hoped-for increased demand? They contend that the introduction of machinery must benefit the employer and the shareholder since the whole object is to reduce costs of production and to increase sales. Therefore, the suggestion is seriously put forward that a fund should be started, consisting of contributions from the financial benefit accruing to the employer, and that from this fund the displaced employés should be paid until

such time as they can be re-absorbed in their own industry or can find other employment.

No resolutions or decisions were arrived at, but the Conference will remain in existence as an organisation to follow up what took place on January 16th.

The discussions at both the morning and afternoon sessions of the Conference were very comprehensive and dealt with the important issues involved from many angles. It was allotted to Mr. Young to put the case for electricity and the part that it should be able to play in the mechanisation of industry. He pointed out that the great need of humanity to-day was not food or houses but energy so that machines controlled by man could be worked faster and faster. During the year 1927 it was computed that all the energy developed in the world from all sources—coal, oil and water—was the equivalent of $1{,}700{,}000\times10^6$ electrical units, but in actual fact only $190{,}000\times10^6$ electrical units were generated so that at that time there was only 11 per cent. of the total energy developed which was electrical. The possibilities of electrical energy in the mechanisation of industry, however, were illimitable owing to the ease with which it could be transported and applied Mr. Young mentioned many directions in which electricity could be applied and could play a dominant part in reducing costs, and went on to predict the mechanisation of the home by electrical aids, owing to the development of the Grid. Speaking of industry, he referred specially to the machine tool industry and urged that greater progress should be made in the application of individual motors to machine tools. The productive efficiency of the nation, he said, had become bound up more and more with the efficiency of the machine-tool industry and the time should not be far distant when every machine tool in every factory in the country would have its own individual electric motor. That would do away with the unsightliness of overhead shafting and the great waste of energy now associated with that antiquated form of power transmission, whilst at the same time making the task of the operators more comfortable and pleasurable, and also increasing output.

Mr. Young expressed the view that too little money was being spent on engineering research, and said that if any Government were bold enough and brave enough to deflect into the research departments of our more progressive industries the millions of money represented in the construction of a single battleship, the results would be startling in their effect upon the efficiency of those industries. We must, he said, look more and more for a solution of the unemployed problem in the creation of new industries and it was there that electricity would play the predominant part.

Mr. C. le Maistre, director of the British Engineering Standards Association, suggested the formation of a committee of employers to discuss the underlying principles of mechanisation and their relationship to standardisation because the two, he claimed, were closely interconnected.

During the course of the general discussions **Mr. Sam Mavor,** of Messrs. Mavor & Coulson, Ltd., Glasgow, said that manufacturers would be encouraged to go in for more mechanisation, and so help to increase the efficiency of industry in this country, if the income tax authorities were to make more liberal allowances in respect of obsolescence of plant as distinct from depreciation. A special-purpose machine tool might be obsolescent in a few years and allowances should be made so that it could be written off quickly. With a great deal of obsolete machinery standing in its books, a firm was not encouraged to go farther in this direction.

Mr. Threlfall, representing Standard Telephones & Cables, Ltd., referred to the possibilities of improvement in efficiency by changes in conveying and transport methods in works. He suggested the need for a " Meccano " type of conveying plant which could be moved from one place to another in the works according to conditions and so obviate heavy expenses of a permanent character on plant not fully occupied owing to the inability to move it quickly.

A representative of Messrs. Lyons suggested the formation by the Government of a central department by which a board of experts would be available to advise small firms as to the best means of mechanising their works.

A luncheon was held in connection with the Conference at which **Sir Horace Wilson,** Chief Industrial Adviser to the Government, promised the assistance of the Board of Trade in connection with the mechanisation of industry.

Although several speakers made much of the fact that production costs were too high, and **Mr. Bruce Gardner,** managing director of the Securities Management Trust, Ltd., which is providing money for the rationalisation of industry in conjunction with the Bank of England, said that whereas imports were coming into the country at an average increase in price of 18 per cent. over the pre-war level we were asking 51 per cent. more for our exports, it was at the same time pointed out by other speakers how seriously we were handicapped by free imports, high labour costs and shorter working hours as compared with the Continent, together with very much higher taxation. It was stated that increased income tax and social services alone had increased the cost of steel by 20s. per ton as compared with before the war, whilst freight charges had put on another 11s. per ton in the same period.

It was pertinently suggested to the labour leaders who complained that mechanisation was putting men out of work that they should influence their Continental colleagues to agitate for similar working conditions to those obtaining in this country so that, apart from free imports, competition would be on a fairer basis.

B.T.-H. Activities.

Work and Progress during 1930.

THERE is much of interest and importance to record in the review of the work carried out by the British Thomson-Houston Co., Ltd., during 1930. Despite the general trade depression, advances have been made in practically all branches of the company's activities, and several new developments have been successfully undertaken.

With regard to steam power plant, the construction of the 67,200-kW turbo-alternator set for the Battersea power station of the London Power Company is nearly completed, and a 50,000-kW turbo-alternator set is in process of manufacture for the Ironbridge power station of the West Midlands Joint Electricity Authority. A 30,000-kW three-cylinder turbo-alternator is also nearing completion in the Rugby works for the Ford Motor Company.

The Kearsley power station of the Lancashire Electric Power Company, where two B.T.-H. 32,000-kW continuous maximum rated turbo-alternators are installed, has attained the distinction of obtaining a thermal efficiency of 24.36 per cent., and thereby takes up the position of the most efficient power station in Great Britain, irrespective of size and output. Continuous development is taking place in connection with the use of fabricated steel frames, shields, and base-plates.

The electrical transmission of power for the propulsion of ships has made considerable progress in that orders have been placed for three important ships fitted with this type of machinery, to a total of approximately 69,000 s.h.p. Two of these vessels, each of 28,000 s.h.p., are for the Australian service of the P. & O. Steam Navigation Company, and the other, of 13,000 s.h.p., is for the Union Steamship Company of New Zealand, for a cross-channel service.

One of the most notable developments of the year has been in connection with metal-clad compound-filled switchgear in which welded fabrication construction is now used to the maximum extent. The general trend of development in oil circuit-breakers has been in the direction of stronger tanks and tops, with oil-tight joints and pressure relief diaphragms.

In anticipation of the national rural electrification scheme a complete line of rural distribution switchgear has been put into production during the year and designs have been made for 17,000 V, 22,000 V, and 33,000 V service. A large order for switchgear was received in connection with the Bedford rural distribution scheme.

Further contracts have been entered into for the supply of control equipments for motor coaches on the Underground Electric Railways of London and control equipments for some 146 additional motor coaches are now in course of manufacture. Electrical equipments for tramcars are being constructed for service in Calcutta, Bombay and Montevideo. Developments in connection with trolley-'bus motors and control gear are in hand, and new equipment will shortly be in service.

Two large transformers have recently been manufactured to the order of Messrs. Balfour, Beatty & Co., Ltd., for the Grampian Power Co. These are interesting because they constitute a world's record to date in the magnitude of the voltage ratings, and, also, on account of the fact that they are three-circuit transformers, *i.e.*, have two output windings. These transformers, which are rated at 20,000 kVA, are installed at Abernethy and are for the purpose of interconnecting the hydro-electric station at Rannoch with the grid.

The electrification of the Manchester South Junction and Altrincham Railway is now nearing completion, and experimental trains have been operated over a short section of the track. The B.T.-H. company has been responsible for the whole of the electrical equipment for the two sub-stations feeding the overhead line, and it is interesting to note that this is the first British railway to operate on the 1,500-V d.c. system.

The output of synchronous motors and generators during 1930 exceeded that of any previous year, ship propulsion motors, water-wheel alternators, Diesel engine-driven alternators and frequency changers constituting the principal types constructed. Among the water-wheel alternators constructed were two 20,000-kVA, 500 r.p.m. machines, which are the largest vertical hydro-electric units so far installed in Great Britain. To meet the requirements in certain districts due to a change of frequency from 25 cycles to 50 cycles, a line of dual frequency motors has been developed.

Considerable advances have been made in talking-picture apparatus, and at the present time some 350 equipments have been manufactured and put into regular use in kinemas.

Further orders were received for all-electric totalisators for Leicester, Pontefract, Wolverhampton, Birmingham, and Ascot racecourses. A good demand was also shown for paper-machine drives, printing-press drives, rolling-mill plant, excavators and tube-welding plant.

Research work carried out in the B.T.-H. engineering laboratory included the development of "Tungar" rectifiers for higher voltages, a special high-voltage air condenser using compressed air or nitrogen as the dielectric, apparatus for the analysis of the components of a complex sound, improved photo-electric cells, and moving-coil loud-speakers with metal cones.

Physical Society's Exhibition—II.

Annual Display of Electrical Instruments and Scientific Apparatus.

The Exhibition Committee was indebted to the Crypto Electrical Co., Ltd., which furnished two rotary convertors, to the Zenith Electric Co., Ltd., which provided transformers, and to Everett, Edgcumbe & Co., Ltd., who installed frequency-regulating apparatus, for making supplies of alternating current available on the various exhibitors' demonstration stands.

Elliott Brothers (London), Ltd.

This collection of instruments included a handy indicator (fig. 3) which shows directly the sense of rotation of the phases of a three-phase circuit. It is essentially a small induction motor, the rotor being a disk of aluminium pivoted above three electromagnets which take the place of the stator in a

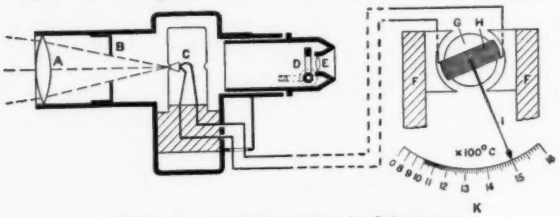


Fig. 1.—" Ardometer " Diagram.

three-phase induction motor. The electromagnets are connected to three terminals coloured red, yellow, and blue, the dial also being marked with the standard instrument phase letters A, B, C. The disk bears a parti-coloured arrow indicating the rotation of the phases when the terminals are connected to the line wires of the circuit. The overall range of the instrument is from 20 to 500 cycles, and from 40 to 500 volts. It is intended for intermittent use only, and is a ready means of verifying connections of three-phase circuits. It is mounted in a leatherette case with a handle, and can be carried in the pocket.

A high-grade portable current tester has recently been introduced which comprises the Shotter patent split-core " clamp " type current transformer with an ammeter. It enables measurements of the current passing in a cable carrying a.c.

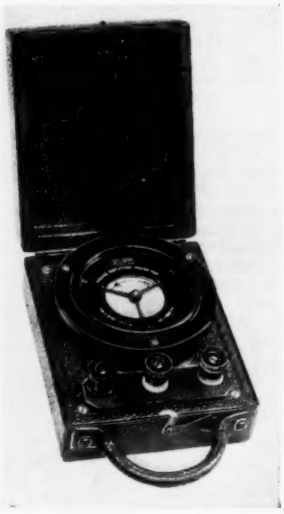


Fig. 3.—Rotary Phase Indicator.

to be made without interrupting the supply or breaking the circuit in any way. It is designed for one frequency and is especially light and compact; four ranges are obtained by merely turning a screw. One can use very long leads without affecting the reading of the indicating instrument, which can also be calibrated as a voltmeter. For use on high-voltage circuits and when the conductors are bare or lightly insulated, a "scissors" type with insulating handles is recommended, and several different patterns of the Shotter transformer are made for testing the current passing through fuses and links in feeder and distribution boxes.

Amongst the telegraph apparatus shown was a relay testing set mounted, together with a differential milliammeter, on a metal panel which fits into a box. All resistances fit into clip bases so as to be easily changeable and the switches are of a robust telephone type with rubbing gold-silver contacts. The electrical circuits have been arranged so that by the operation of four switches relays may be examined for all electrical and mechanical defects, which are indicated by the movement of the pointer, the freedom of the armature being measured quantitatively, so that instruments may be graded in order of their mechanical merit.

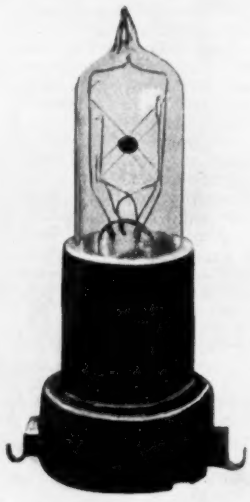


Fig. 2.—Thermo-couple Bulb.

Amongst the heat economy and temperature control apparatus (in association with Siemens Brothers and Co., Ltd.) were " Ardometer " total-radiation pyrometers (figs. 4 and 5). The radiation from the hot body whose temperature is to be measured is focussed by lens A (fig. 1) through diaphragm B on to a small blackened platinum disk C (and fig. 2) to which two thermo-couples are hard-soldered. In order to get as large an e.m.f. as possible the couples are connected in series and enclosed in an exhausted glass bulb (fig. 2), which is filled with argon gas for the measurement of temperatures above 1,200 deg. C. The thermo-couples are connected by twin copper cable to an automatic recorder, or a millivoltmeter calibrated directly in temperature

Fig. 4.—" Ardometer."

Fig. 5.—Water-cooled " Ardometer."

degrees, of which F is the magnet, G the iron core, H the moving coil, I the pointer, and K the scale. The telescope is sighted on to the hot object by the adjustable eye-piece E, between which an absorption screen D can be interposed by turning a milled head to avoid dazzling the eye without affecting the indicator reading.

British Electric Resistance Co., Ltd.

Double woven asbestos resistance nets made by a patented method of weaving, whereby 250 per cent. more resistance can be obtained than on a similar size net of the single woven pattern, produces a sturdy resistance in a very compact form-

Nets, bands, and flat strip-wound grids for heavy duty work, also nets specially designed for low-temperature wall-panel and ceiling heating were on view. "Berco" patented resistance embodies novel features and is most suitable for fine regulation, such as is required by theatre dimmers, &c. The contacts consist of flat copper segments, mica insulated and arranged in the form of a flat commutator; a carbon brush is so arranged as always to bridge three segments, thus ensuring perfect continuity of circuit. Patented rheostats are wire-wound on vitreous enamelled steel tubes of hexagon sections with a new type of brush gear, consisting of metallic carbon contacts, which ensures an exceedingly low-resistance contact, smooth regulation, and freedom from jamming when run at excessive temperatures; the small percentage of graphite in the brush acts as a natural lubricant, reducing friction and wear on the wire. Resistance cord 1/16 in. in diameter, consisting of a centre asbestos core spirally wound with fine gauge nickel chrome oxidised wire, in values between 5,000 and 600,000 ohms per yard; also nickel chrome resistance wires in fine gauges down to 0.0008-in. diameter, and radial contact switches for heavy duty, incorporating strip corrugated tapped resistance elements, were shown.

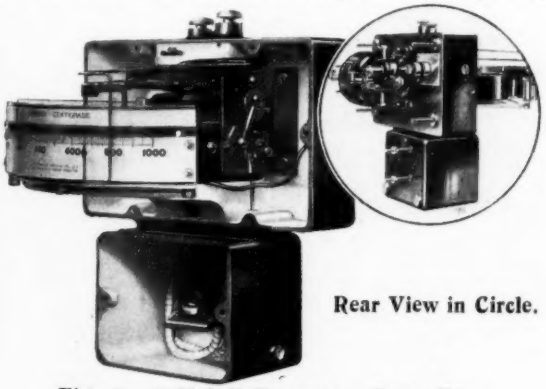
Evershed & Vignoles, Ltd.

This year the company entirely changed its method of arranging its stand, which was devoted, therefore, to the showing of improved instruments. The chief exhibit was a working facsimile model of the "Midworth" system of distant control for sub-stations recently installed by the L.M. & S. and L.N.E. Railways at Altrincham. It used the full-sized apparatus actually employed in the installation, and an ingenious system of circuits enabled the working conditions to be reproduced precisely (see also pages 136-8 this issue).

Another model of considerable interest was a "Megger" earth tester used for geophysical surveying. It has been found to be of practical value in determining the depth of strata, and much work has been done, particularly in North America, in this direction. The model showed in miniature form experiments which were carried out on Cleeve Common, near Cheltenham, last autumn. Other improved instruments shown on the stand were the "Bridge-Meg" resistance tester with Varley loop facilities, a new 1,000-volt "Meg" insulation tester, and a combined ohmmeter and capacity meter.

Electroflo Meters Co., Ltd.

This display of pyrometer equipment included a totally-enclosed high-resistance indicator, a new model multipoint recorder, and contact and molten metal immersion types. The "Unit" outfit (fig. 6) is a combination of pyrometer with controlling mechanism and switching means so designed as to open or close electrical circuits for the automatic regulation of heaters, motors, &c. A special feature is the mercury contactor switch, which will handle as much as 30 amperes at 440 volts without any relaying mechanism. For light-duty electric furnaces up to about 10 kW capacity the pyrometer can be connected directly to the furnace heaters, or, in the case of larger furnaces, to the coils of the main circuit breaker. For fuel-fired furnaces the switch will govern motors operating



Rear View in Circle.

Fig. 6.—"Unit" Pyrometer Controller.

valves, damper mechanism, or other machinery. The pyrometer has a high-resistance movement with automatic cold-junction correction. The control mechanism is a simple mechanical device, the position of a power lever being determined solely by the position of the indicating pointer. The action is positive and very close control can be effected. Since by means of the motor-driven cam any required lifting force is available, heavy mercury switches can be employed, and the advantages lie in the elimination of relays and delicate contacts operated by the moving pointer, with the simplification of operation and installation resulting therefrom.

An optical pyrometer for high temperatures, based on the principle of the radiation of light, is distinguished by the compact arrangement of the necessary optical and electrical parts in a simple casing (fig. 7) which resembles a telescope. The instrument is focussed on to the hot body under measurement, and the brightness of a small elliptical mark superimposed over the image of the hot body is adjusted by rotating a graduated absorption disk until it disappears from view. The temperature is then read directly from the large scale attached to the disk, the scale being very nearly proportional to the degree of rotation. A small flash-lamp and battery, ammeter and rheostat, are in circuit with a small internal lamp which illuminates the elliptical mark of comparison and maintains its intensity (brightness) constant.

A mechanically-operated fluid-flow meter operates in conjunction with any of the accepted forms of differential media, *i.e.*, venturi tube, orifice plate, carrier-ring orifice plate with integral tappings, pitot tube, &c. The indicator scale and recorder chart are evenly graduated, an advantage over the common quadratic scale, which makes it easier to read low rates of flow accurately. The movement of the float is trans-

Fig. 7.—A Neat Optical Pyrometer.

mitted to the external recording instruments by magnetic coupling having a torque ten times in excess of that required. The usual spindle operating through a bushing is, therefore, eliminated and leakage and friction troubles reduced, while there is no direct connection between the internal parts of the meter body and the external recording instruments.

A departure from contemporary methods is the integrator, which is said to be virtually frictionless. It is dependent on the relative positions of two lipped disks, which enclose to a greater or less extent, according to the rate of flow, a ratchet wheel geared to the counter train. The inter-position of the lips of the disks between the ratchet wheel and uniformly-rotated pawls determines the amount of motion communicated to the counting train.

Kelvin, Bottomley & Baird, Ltd.

On this stand a "Pneumercator" distant-reading boiler gauge was noticed. It brings the water-level reading down to the level of the firing floor and thus overcomes the difficulty involved with modern high-pressure boilers in which the steam drum is usually high above the firing floor where the attendant is posted. The principle of operation involves no mechanical or electrical working parts and the gauge may be placed above, below, or at any reasonable distance from the boiler. It gives an exact replica of the steam-drum gauge-glass indication and the system merely contains some water from the boiler and a little air imprisoned above it.

Gambrell Bros., Ltd.

Apart from d.c. instruments and radio-frequency apparatus, an unusual form of wave-meter (due to Dr. N. W. McLachlan) was seen. It is simple and compact, a single screen-grid valve is used, and a reaction coil and incoming signal are dispensed with, while calibration is independent of the valve. It is applicable to long and short waves and is of great accuracy. A radio-frequency circuit consisting of condenser and low-loss coil is connected in series with an audio-frequency circuit consisting of a choke and condenser; they are inserted in the anode circuit of the valve and by supplying suitable voltages to the screening grid, control grid, and anode circuit the negative resistance is low enough for the radio and audio circuits to be set simultaneously in oscillation. The result is a radio frequency modulated by an audio frequency, and modulated continuous waves are radiated which cause any receiver to reproduce the audio-frequency note; thus no heterodyning is required.

British Thomson-Houston Co., Ltd.

In the experimental section of the show the company showed noise analysis apparatus, a high-voltage condenser with compressed air or nitrogen as the dielectric, and mercury-vapour hot-cathode rectifier equipment. Properties of photo-electric cells were demonstrated, and experiments arranged to illustrate phase-change in tuned circuits, electron impact effects, and the change of effective inductance due to varying permeability.

Power Station Efficiencies.

The Trend of Modern Practice.

By PERCY E. RYCROFT, M.B.E., M.I.E.E.

(*Abstract of a paper read before the* INSTITUTION OF ENGINEERING INSPECTION.)

FROM 1921 to 1930 the output of the public electricity stations in this country increased by 131 per cent., while the coal consumption increased by only 50 per cent. Whereas the highest overall thermal efficiency obtained by any station during 1921 was 17.75 per cent., the corresponding figure for the year ending March, 1930, is 24.36 per cent., and during the same period the lowest amount of coal consumed per kWh generated has been reduced from 1.93 lb. to 1.18 lb. In 1918 40 stations were generating 2,250 million kWh, with an average fuel consumption of 2.57 lb. of coal per kWh, while the remaining 381 stations were only generating a little over this total, for which they consumed an average of 4.32 lb. of coal per kWh. The proportion of electricity produced by the smaller and more inefficient stations is now being steadily reduced, and with the extension of the national scheme only the selected and more efficient installations will continue to operate. Although the average of 1.97 lb. of fuel consumed per kWh for the year ended March, 1930, is a vast improvement over the average of 3.11 lb. of fuel consumed in 1922, there is still an appreciable difference between the average figure and the best obtained, and within a comparatively few years an average figure of 1.25 lb. of fuel per kWh generated may be looked for. It is safe to assume to-day for prime movers of about 20,000 kW a steam consumption of 10 lb. per kW as a reasonable figure. The actual generation of the steam required to operate a modern power house introduces many more variable factors, and it is in this department of electricity supply that perhaps the greatest progress has been made during the last 15 to 20 years. It is on the maintenance of a high efficiency in the boiler house that the final overall thermal efficiency of the complete station depends, and also the cost at which electricity is produced.

By far the most notable power station performance for the year ended March, 1930, is that of the new Kearsley station of the Lancashire Electric Power Co., which shows on only six months working an overall thermal efficiency of 24.36 per cent., for the relatively small output of 64 million kWh, and a load factor of 55 per cent. The outstanding features of this par ticular plant are its relative simplicity, and the fact that the steam conditions are only 300 lb. per sq. in. and 700 deg. F. It is common practice in the modern station to extend the boiler auxiliaries to a considerable height, and although by this means savings in ground space and the actual building may result, these advantages are undoubtedly obtained at the cost of a certain loss in accessibility. In the case of Kearsley all motors operating both the induced- and forced-draught equipment are at the firing-floor level, and the economiser and air preheaters are behind the boilers; the steel chimneys are also erected on the ground line.

The six water-tube boilers now in course of construction for the Battersea power station of the London Power Co. will have each an actual evaporative capacity of 312,000 lb. per hour, 600 lb. per sq. in., 830 deg. F. Another installation which will be a matter of very considerable interest to all engineers is the large power plant now being put down at the Ford works, at Dagenham. In this case there are to be three large units, each having an evaporative capacity of 200,000 lb. of water per hour, and arranged for a working pressure of 1,400 lb. per sq. in. The increased steam pressures are in some cases being made use of to drive primary turbines designed to exhaust steam at pressures suitable for the ordinary steam ranges. This arrangement was first adopted at the Langerbrugge power station in Flanders some four or five years ago, and has met with a considerable amount of success. A similar arrangement has recently been adopted at the power house of the Bradford Corporation. In this case the initial steam pressure is 1,100 lb. per sq. in., and the primary turbine exhausts at the main pipe-line pressure of 275 lb. per sq. in.

A further system of reheating the steam after it has passed through one or more preliminary stages in the turbine and has lost a considerable amount of its original superheat has been installed in some cases, notably at the North Tees power station of the Newcastle-on-Tyne Electric Supply Co., Ltd., and also on two of the boilers at the Barking station of the County of London Electric Supply Co., Ltd. It is interesting to note that in the latest specification issued by the Newcastle Co., in connection with an extension of plant at its Dunston power station, this system of steam reheating has again been arranged for.

The original proposals as to pulverised-fuel firing offered the advantage of a very flexible condition of running, and it seemed possible that the system afforded better facilities for air regulation, and, therefore, continuously higher CO_2 contents and improved overall efficiencies. The initial difficulties were considerable, including rapid destruction of the refractories in the furnace, trouble as regards pulverising, drying and feeding to the furnace, the emission of fine grit and dust, and the expense involved by the power required for pulverising purposes. These difficulties have been reduced during recent years, but the majority of them have still to be faced in some degree, and very particularly as regards the emission of fine pulverised dust. Parallel with the development of the pulverised-fuel firing, however, great improvements have taken place in connection with the mechanical firing of raw fuel, and to-day mechanical stokers can be satisfactorily constructed for the largest furnaces. It should be borne in mind that the actual process of pulverising requires an excess expenditure of power over that required for the operation of mechanical stokers of at least 20 kW per ton, and the net effect of this is that pulverised-fuel firing must maintain at least 1½ per cent. better efficiency than mechanical-stokers, if it is to develop a commercial efficiency of equal value.

Discussion.

Mr. Hal Gutteridge (president) said the increase in the efficiency of power stations had been due in no small measure to the rise in steam pressures, whilst the rise in steam temperatures had also contributed. At the East River power station of the New York Edison Co. there were three 300,000-lb. boilers, each with ten pulverised-fuel burners, and also three 750,000-lb. boilers each with 20 burners. These boilers all operated at a pressure of 475 lb. per sq. in., and for a period of 20 minutes, on test, the three larger boilers produced steam at the rate of 1,000,000 lb. per hour. On the electrical side there were two 60,000-kW and one 160,000-kW turbo-alternators operating on one spindle only. The first turbo-generator in the new Chicago station had a rating of 208,000 kW in one "group" unit of three spindles, and was now the largest electricity producing unit in operation anywhere in the world. The station was planned for five units with a total ultimate capacity of 1,000,000 kW. Means were provided whereby any one of the three turbo-generators comprising the "group" unit might be taken out of service and the other two continued in operation. The steam was supplied by six 450,000-lb. boilers with steel drums 52 in. in diameter, built for 800 lb. per sq. in. working pressure, but operating at 650 lb. Pulverised fuel was used, each boiler having eight burners; a new feature was separate gas ignition for each burner. The new equipment at that power station now in course of erection would comprise two 150,000-kW turbo-alternators supplied with steam at 1,400 lb. per sq. in. pressure and delivered at the turbine stop valve at 1,325 lb. and 835 deg. F.

Major E. J. Stuart referred to the question of heat insulation in large power stations. Taking a power station with 5,000 sq. ft. of pipe, turbine, and other surfaces which required insulation, the loss, if there were no insulation at all, according to National Physical Laboratory tests, would be 240 million B.th.u. per year, equivalent to 10,000 tons of coal per annum, which would generate 20 million kWh of electricity. The best material at the present time from the thermal conductivity point of view was glass silk, which was now the standard in Germany, and far superior to asbestos rope.

Mr. J. Golder remarked that although a great deal was made of the increasing efficiencies of power-station working, even supposing it reached 30 per cent. in the next few years, what about the 70 per cent. that was lost! The work of obtaining degrees of improvement in operating efficiency had developed into over-specialisation, and more attention should be paid to the heat units in the coal that were lost.

Mr. Noel King said that in some recent extensions at the Langerbrugge station in Flanders Benson boilers had been adopted operating at 3,000 lb. per sq. in., and they had been working satisfactorily for some 6 or 8 months in commercial service. The output of each boiler was 200,000 lb. of steam per hour, and the claim was for over 28 per cent. station efficiency. An important development on the electrical side was the adoption of electricity for driving the auxiliaries.

Mr. E. F. Hall said that although the author had expressed himself against the use of pulverised fuel, that was not the general opinion so far as large power stations were concerned. As to 70 per cent. of the heat units in the coal going into the circulating water, that, unfortunately, was the fact, and so long as water had to be used as the cooling medium it would continue to be so. He believed there had been experiments with

other media, mercury, for example, but the results had not been altogether successful. One could not look with equanimity on a leak of mercury vapour, because it would quickly poison anyone who attempted to repair it. He suggested that engineers were losing sight of the main essential, *viz.*, the production of cheap electricity, and concentrating too much on the efficient generation of electricity.

Mr. **R. P. Wilson** was inclined to support the view that over-complication in power stations was suicidal, because the essential thing, for commercial efficiency, was to keep the capital expenditure down.

The Author, replying to the discussion, said there was great anxiety on the part of power station people in America to go one better. He had been told that it was really a matter of competition between them as to who should have the largest unit. As regarded powdered fuel, he agreed that, properly applied, it could be as effective as other forms of fuel, but the whole point which turned him against the use of powdered fuel for large power stations was that with a 60 or 70 per cent. load factor there was not much fluctuation in the load, and so the questions of flexibility and response to load fluctuations did not come in.

Some Radio Developments.

A new method of measuring resistance and reactance at radio frequencies; a cylindrical condenser which is also applicable as a short-wave meter.

(*Summaries of two papers read before the* WIRELESS SECTION *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

TWO papers were read at the January meeting of the Wireless Section of the I.E.E. in London, both of which were accompanied with demonstrations.

Method of Measurement.—Messrs. F. M. Colebrook, B.Sc., and R. M. Wilmotte, M.A., A.M.I.E.E., described how the radio-frequency resistance of coils can be ascertained in a new way, their method being essentially a development of that originally devised by P. W. Willans, and described by P. K. Turner. It depends on the measurement of frequency and capacity, so that a wavemeter and calibrated condensers of good quality are required, but no other measuring instruments are necessary. It is distinguished in this respect from the method of Mallet and Blumlein, which it otherwise resembles inasmuch as it depends on the effect produced by the coil under investigation on another tuned circuit to which it is inductively coupled.

The method depends on the change in reactance of a valve-maintained oscillating circuit when it is coupled to the circuit under investigation, and does not require any measurement of current or voltage. Moreover, it can be applied to the measurement of unknown impedances (*e.g.*, the input impedances of valves, the impedances of aerials, &c.) by associating these impedances in some suitable manner with a coil and measuring the apparent change in the constants of the coil. Measurements have been made at about 10 million cycles per second, but the method can probably be used at higher frequencies than this.

The accuracy obtainable cannot be specified as an overall percentage figure, as it will depend on the accuracy with which variable condensers can be read and on their total readings, but there is room for improvement by modifying the condenser system and also of the design of the first oscillator, and work will be continued in this direction.

The consistency is generally better than two per cent. The absolute accuracy appears to be not quite as good as this.

Some measurements were made at a wavelength as short as 28.4 metres (about 10 million cycles per sec.). Given a satisfactory earthing system, the method is quite easily workable at such frequencies, though it requires a little more care.

There appears to be no lower radio-frequency limit, though with coils of ordinary dimensions the error due to variation of the frequency of the first oscillator with resistance will become more pronounced at the lower end of the radio-frequency range.

It is not intended to invite controversy by making extravagant claims for the method in comparison with others. However, methods involving current or potential measurement are usually liable to errors due to variation of the effective induced e.m.f. caused by reaction on the source, or by modifications of the geometry of the system during the measurement. The present method is free from such errors.

Mr. A. C. Gordon-Smith, of the National Physical Laboratory, constructed much of the apparatus used in this investigation and made practically the whole of the measurements and observations involved. The work was carried out as part of the programme of the Radio Research Board, and is published by permission of the Department of Scientific and Industrial Research.

Cylindrical Condenser. — Mr. E. B. Moullin, M.A., A.M.I.E.E., in describing a new condenser that has been developed for precision measurements at very high radio frequencies, pointed out that an accurately calibrated instrument of small variable capacitance is often required for plotting resonance curves of radio-frequency circuits. At frequencies of the order of 3×10^7 cycles per sec. the total capacitance of the circuit is very small, and the main part of the resonance curve will then be included within a minute change of capacitance. It is therefore necessary to plot curves whose width is only a few tenths of a micromicrofarad, a process which requires a variable condenser having a very open scale. It need have neither a large ratio of maximum to minimum capacitance nor an extremely small minimum, but the total change of capacitance must be very small and should at any rate be comparable with the minimum value. In some parts of the scale a movement of about 30 angular degrees should correspond to a capacitance change of about 1 $\mu\mu$F. Such an instrument is difficult to calibrate, and to do so requires access to a very perfect capacitance bridge with very unequal ratio arms. There is much to be said for a condenser whose change of capacitance can be calculated, so as to obviate the difficulty of experimental calibration. At very high frequencies the total intentional inductance of the circuit may be of the order of 1 μH, and it is extremely important that the residual internal inductance of the condenser should be small and not change appreciably with capacitance.

A parallel-plate condenser does not seem very suitable for the purposes described, whereas a cylindrical type has much to recommend it, since it is self-screening and has a residual inductance of calculable value.

One cylinder is always totally enclosed by the other and the capacitance is varied by altering the distance between the axes of the cylinders by rotating the inner cylinder about an axle which is eccentric with both cylinders. With the dimensions chosen, the capacitance is increased by 1 $\mu\mu$F by rotating the pointer through 45 deg. from the position of minimum capacitance; the total change of capacitance is 16 $\mu\mu$F. The capacitance values engraved on the scale are determined by calculation and not by experimental calibration. It is shown by electrostatic principles that the end-effect capacitance is likely to be substantially constant as the position of the inner cylinder is varied, and this supposition is supported by several exacting tests by experiment; the validity of the calculated scale is thus vindicated.

Its outstanding use is for plotting resonance curves, and it may be employed either as the variable condenser of a tuned circuit, or as a means of varying the frequency applied to a fixed circuit. It can also be used in capacitance bridges for measuring the dielectric constant of gases, and in cases in which the dielectric constant is only a few parts in a thousand greater than unity. Using an equal-ratio bridge, balance is obtained against an air condenser of capacitance about 100 $\mu\mu$F, which is then filled with the gas to be measured, balance being restored by means of the tubular condenser. Given adequate sensitivity in the indicator, the increase of capacitance could readily be measured to 0.01 $\mu\mu$F, while the desirability of an equal-ratio bridge for small-capacitance measurements could still be retained.

Use as an Inductance.—If the top of the rotor is connected to the outside cylinder, then the current which enters passes up the rotor and down the outside cylinder to the case. The system thus forms a self-screening inductance whose value can be varied by revolving the rotor. The calibration in terms of inductance change can be deduced from the capacitance calibration.

Small-range Wavemeter.—The tubular inductance and tubular condenser can be combined to form a robust and self-screening short-wave wavemeter of small range. Capacitance is in two parts, one fixed and the other variable. The whole of the capacitance is self-screening and all but a small fraction of the inductance is screened, so that the natural frequency of the circuit cannot be disturbed by surrounding objects. Since the whole wavemeter is enclosed in a thick copper tube the instrument is extremely robust and is suited to portable and field use. When suitably designed it must also be very permanent in calibration, because small mechanical displacements make very small changes of capacitance or inductance.

The instrument was used with a thermionic voltmeter as an indicator, connected across a few centimetres of the earthy leg of the inductance. In a standard instrument it would be preferable to connect the inductance to the screen tube through the heater of a thermal ammeter. The range is from 10.0 to 10.4 metres and the range of capacitance is about 8 $\mu\mu$F. The instrument is capable of measuring a wavelength correct to about 0.07 per cent.

Electric Battery Locomotives.

Their use for haulage purposes in tunnelling, mining, and similar excavating operations when horse, steam, and petrol traction are not admissible.

(Extracts from a paper read before the LONDON BRANCH *of the* ASSOCIATION OF MINING ELECTRICAL ENGINEERS.)

THE paper was read by Col. G. D. Ozanne in the absence of the author, Mr. N. E. Bayliff, who maintained that the constant improvement of batteries and locomotive construction generally during the past few years had made the operation of this type of locomotive in most situations, including underground workings with their peculiar demands, highly efficient on any track system of which the grades did not exceed 3 per cent.

Only the smaller types of such locomotives and their applications were reviewed, *i.e.*, those designed to haul a load varying from 10 to 30 tons over, for example, the indifferent tracks often used by public-works contractors. Such locomotives were first used in London on the tube railway extension works between 1921 and 1926. They were also used at about the same time on the London County Council's outfall sewer works, and had been used on every tunnelling contract of any size in this country since that date. About that time, also, the Sydney (Australia) Metropolitan Water, Sewerage, and Drainage Board decided to have two 10-ton capacity storage-battery locomotives. Their overall dimensions were 6 ft. 9 in. length, 3 ft. 3 in. width, and 3 ft. 3 in. height over the rail level. The total weight of the locomotives in running order was 2¼ tons, and whilst the normal drawbar pull was 300 lb., a maximum of 1,100 lb. was possible. When hauling its full load on the level, each locomotive was capable of an average speed of from 3½ to 4 miles per hour. As the wheel base was 2 ft. 4 in. the locomotives could negotiate curves of 11 ft. radius. All four wheels were driven through machine-cut spur gearing by a single totally-enclosed motor and power provided by a "Ni-Fe" battery of 40 cells having 215 ampere-hours capacity.

Very thorough tests of the performance of those locomotives had shown that over 20 miles distance could be travelled per battery charge when running with full load in one direction and returning with empty skips, the average ton-mileage for each locomotive being 130 per battery charge. The actual input to each battery during the charge was 21.65 kWh and, based on an energy cost of 1d. per kWh, the cost of power per locomotive was 0.16d. per ton-mile.

It was doubtful whether any other form of underground transportation could show operating results approaching that remarkably low figure. Moreover, in the Sydney case the tractive effort required was equivalent to a 35-lb. pull per ton, as compared with the more common average of 25 lb. with mining skips. In order to expedite the work at Sydney it was decided to install three further electric storage-battery locomotives rated at 15 tons each capacity.

In lead and ironstone mines similar locomotives had proved their value. A few years ago two were purchased for gathering ironstone to see if they could satisfactorily replace ponies. They hauled trains of tubs weighing approximately 5 tons from the face, and returned with empty tubs, dealing with about 150 tons per shift and doing an average run of about 16 miles. As a result of that experiment the company had now 14 locomotives in service.

In the lead and zinc mines of the Halkyn area of North Wales such locomotives had been employed for about 18 months and, as compared with the ten ponies and ten men previously used, a saving of £20 per week had been made. In that particular case special care had been taken to protect the motors from water. Two motors were employed, each driving one axle independently, the total h.p. available being 12½ at the one-hour rating. The battery used comprises 30 "Exide-Ironclad" cells, accommodated in two steel containers, each arranged for quick removal. Another locomotive of the same type had recently been put into service.

The River Mersey tunnel now in course of construction was also well-served by a number of battery locomotives, each designed to haul loads of from 5 to 7 tons up a gradient of 1 in 30, and equipped with "D.P. Kathanode" batteries.

A leading mining engineer who has control of extensive works in North Wales had carried out exhaustive tests over a period of 12 months with a view to determining the relative costs of employing horses hired by the day with drivers, petrol locomotives, and storage-battery locomotives. For identical work the total costs for the three systems were as follows: horses £657, petrol locomotives £442, battery locomotives £236. In the cases of both types of locomotives the figures included repairs, drivers' wages, interest, depreciation, and cost of fuel, *i.e.*, petrol and electricity, respectively. The following example was given of the cost of an average small battery locomotive :—

	£ s. d.
Depreciation on locomotive, £270 at 10 per cent. per annum	27 0 0
Depreciation on battery, £155 at 33⅓ per cent.	51 13 4
Depreciation on charging plant, £108 at 10 per cent.	10 16 0
Repairs, renewals, oil, grease, and sundry spares	8 0 0
Total	£97 9 4 Per week.
Standing charges (assuming 50 weeks working per annum)	£ s. d. 1 19 0
Power for battery charging, 24 cells, 22 kWh per full charge, 7 charges per week, 154 kWh at 1½d. per kWh	19 3
Total running cost per week of 7 days	£2 18 3

Battery life under good conditions with ordinary care was approximately four years, and it was suggested that in comparing those figures with the cost of steam locomotives the cost of battery replacement, together with power cost of charging, might quite legitimately be set against fuel cost. The following figures related to large electric locomotives. Maximum hauling capacity, 15 tons on level track; normal duty, 8 tons; maximum gradient encountered, 1 in 75 against loaded train. Capital cost of two locomotives, each with one spare battery, and charging plant for charging two batteries simultaneously, £1,236 10s. :—

	£ s. d.
Interest on capital at 5 per cent.	61 16 0
Depreciation on locomotive, 10 per cent. on £600	60 0 0
Depreciation on four batteries, 33⅓ per cent. on £480	160 0 0
Depreciation on charging plant, 5 per cent. on £125	6 5 0
Repairs, maintenance, renewals	20 0 0
Total annual charge	£308 1 0

Extreme simplicity and sturdy construction were responsible for their almost entire freedom from breakdown. Nothing but very minor derangements need be expected for at least the first five years of service. Assuming the locomotives worked on three shifts per 24-hour day, the output would be 180,000 tons of ore in 300 days; each hauled 100 tons of ore per shift. The proportion of the annual charge to be borne by each loco per shift was 3s. 5d. or 0.14d. per ton of ore. Power for battery charging (one charge per shift) :—

	s. d.
24 kWh at 0.75 per kWh	1 6
Drivers' wages	10 6
Per shift	11 6
Per ton of ore output	1.38
Total all-in cost per ton of ore output	1.79

Alternatively, per ton-mile, the mileage covered per shift with loaded wagons was only 7½, which represented, with 5 tons of ore per train, 36 ton-miles.

	s. d.
Annual charges per shift, as above	3 5
Power and drivers' wages, as above	11 6
	14 11
Total all-in cost per ton-mile (of ore)	5d.

Discussion.

Mr. G. M. Harvey said that reference had been made to the danger which might arise when using battery locomotives in coal mines from the emission of gas from the batteries, but it was difficult to conceive how danger could arise if the apparatus were explosion-proof, as there was very little likelihood of open sparking in the battery container during working. Would the hydrogen emitted by batteries be likely to have any injurious effects upon the drivers in tunnels, and would any advantages be derived by positioning the motor across the frame rather than longitudinally?

Mr. H. M. Morgan's opinion was that the tracks used underground in this country in future would have to be heavier and better constructed than those to which they had been accustomed hitherto. It had been the policy to use light tubs

in order to ensure that when they ran off the rails the men could place them back readily, but he would prefer to use bigger tubs and to have the track constructed in such a way that the tubs would not run off the rails.

Mr. J. W. Gibson (president of the Association) thought the figure of 3s. 5d. per shift (representing the proportion of annual charges to be borne by each locomotive) was a low one. The Fife Coal Company was experimenting with electric locomotives underground, and he thought it was using lead-acid batteries. He believed that the nickel-iron battery was assumed to have a life of three years, and that the life of the lead-acid battery would probably be much shorter, judging by the strengths of the two types. When in America some four years ago he had seen in use underground some electric locomotives only 2 ft. high, and in another American mine (which was non-gaseous) a trolley wire was used for feeding the locomotives, which were very much larger.

Mr. J. R. Walton (Branch president), discussing the emission of inflammable gases from batteries, said that if the Americans were satisfied it seemed that there was not very much to be scared about here. In one case steam locomotives on an out-door track had given trouble continually due to wheel slip when the track became wet; for that reason they had been scrapped in favour of haulage by stationary engines, and the results obtained were better. If battery locomotives had been used the same difficulties would have been experienced, so that, apparently, battery locomotives could not replace other forms of traction under all circumstances.

Colonel Ozanne, replying to the discussion, said the alkaline battery undoubtedly had a very much longer life than the lead-acid battery. The American Edison battery was guaranteed for ten years, whereas the lead-acid battery was guaranteed for only three years. Probably, however, the lead-acid battery had a certain advantage on overloads, in that it would not heat up quite so rapidly as the alkaline battery where steep gradients were encountered. When using a worm drive it was more convenient to place the motor in the locomotive longitudinally than crosswise. In the earlier designs the motor was placed crosswise, because with a spur-gear drive that was the more convenient position. Naturally, the better the rails that were used the better would be the results obtained. A quite good weight was 25-lb. rails;the gauges varied from 18 in. to the ordinary standard. He agreed that it might be more convenient in some cases to use larger tubs, but it seemed to him that in other cases it would be quicker to fill a larger number of small tubs; again, where sharp corners had to be negotiated the small tub had an advantage.

The figure of 3s. 5d. per shift represented only the standing charges and did not include the charges for the supply of electricity, and so on. It was merely the proportion of the annual charges to be borne by each locomotive per shift and battery charging, drivers' wages, and so on, had to be added. Very small locomotives were known in Canada as "trammers" and he had actually seen some which would fold up. The seat was at the back and the driver when seated could just see over the top; the whole of the back part was folded over the top, so that the locomotive could be placed in a lift. It might haul 4 or 5 tons, and he believed some of the very smallest hauled loads as small as 2 tons. As to the possibility of the motor stalling, a "dead man's handle" was provided One obvious advantage of locomotive haulage over rope-haulage was its flexibility. The extension of a rope-haulage system would occupy far more time than the throwing down of a track, but obviously the effectiveness of a locomotive was governed by its weight and wheel slip. Generally, the battery-locomotive system was rather cheaper and more flexible than other systems of transport, and there was the advantage that the man in control of a train was on the spot and was in a better position to avoid acidents than was a man who controlled a rope from a distance.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

A New Testing Set.

The "Dynameg" has been produced by DYNAMEG, LTD., 41, Oriel Road, Bootle, as an efficient and reliable fault finder and testing set for wiring installations to fill the gap between the expensive standard testing set and the somewhat primitive test lamp, bell and battery and galvanometer. As a fault finder the Dynameg is useful, because it combines in one small instrument the functions of test lamp up to 500 volts, polarity indicator from 20 to 500 volts, circuit and line tester, a.c. and d.c. indicator, earth tester and insulation tester. The apparatus is

Fig. 1.—The No. 2 "Dynameg."

made in two models, No. 1 and No. 2. Both are entirely the product of British labour and materials, are strongly made and attractively finished in solid oak cases with n.p. fittings. No. 1 instrument will give only an approximate indication of insulation leakage by the comparative glow on the lamp on circuits of no capacity, as the output is a.c. In No. 2 instrument, fig. 1, the generator is designed to give both a.c. and smoothed d.c. By simply turning a switch, insulation-resistance readings are given directly in megohms. The recording instrument of "Dynameg No. 2" is specially designed and manufactured by Messrs. Ferranti, Ltd

In ordinary practice it is found that readings in excess of, say, 6 or 7 megohms, are not of much real importance, except for record purposes, so the readings on the Ferranti instrument have been kept well open, thus giving greater accuracy in the range from zero to 3 megohms.

A Flameproof Electric Signal.

The flameproof audible electric signal illustrated in fig. 2, a product of KLAXON, LTD., 36, Blandford Street, W.1, is specially designed for use in explosive atmospheres where audible signals are required. The apparatus consists of an enclosed electric motor suspended within a strong iron-clad outer casing. The operation of the signal is on the "Klaxon" principle of the rotor striking the diaphragm, and a clear, powerful note is emitted. The lead-in is through a cable gland

Fig. 2.—Flameproof "Klaxon" Signal.

screwed into a boss cast on the outer casing, and the internal connections to the motor are made by means of insulated terminal stems in the wall of the motor enclosure. Two substantial lugs are fitted to allow a flush wall mounting, and the instrument throughout has the appearance and performance of a thorough and practical job. The apparatus is built to B.E.S.A. Specification 229-1929, with certificate No. 326 given by the Mining Department of Sheffield University. The audible range of the signal is one-third of a mile, and the dimensions of the device are 5½ in. by 7 in. dia. The motor is wound for from 6 to 250 V d.c. and a.c.

A Portable X-Ray Machine.

The accompanying illustration, fig. 3, depicts the "Simplex" portable X-Ray machine which was displayed by Messrs. A. E. DEAN & Co., Leigh Place, Holborn, London, at

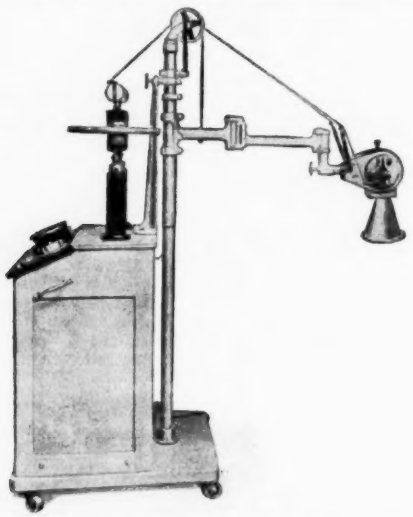


Fig. 3.—"Simplex" X-Ray Machine.

the recent Radiological Exhibition (ELECTRICAL REVIEW, December 19th and 26th, pp. 1039 and 1075). The machine operates direct from a.c., or *via* a rotary convertor from d.c. mains, for general radiography. It comprises an oil-immersed transformer all enclosed in an oak cabinet, and is provided in front with a desk-type switchboard equipped with a kilo-volt meter, transformer induction changer, filament control switch and rheostat, main exposure switch, and a plug for foot control. The top of the cabinet is provided with coronaless milliampere and ampere meters. All the high-tension cables feed a tubestand mounted on the front of the cabinet and provided with counterpoised rise and fall movements, with a fitting to take "Metalix" type tubes. The machine is mounted on large rubber-tired wheels and is complete with a length of flexible lead for connecting up to the mains. The whole outfit is very sound and practical in design, and its simplicity, both regarding its operation and the connecting up of the different components, is an outstanding feature. Messrs. Dean have supplied such machines to many hospitals throughout the country, and they have given general satisfaction.

A 50,000-W Incandescent Lamp.

In place of the arc lamps and mercury-vapour tubes hitherto used for lighting purposes in connection with the "shooting" of kinematograph films, high-power incandescent lamps are beginning to be employed. In this connection it is interesting to learn that the Osram Gesellschaft, of Berlin, has recently succeeded in producing a 50,000-watt incandescent lamp capable of giving a light equal to 1,100,000 Hefner lumens. The bulb used is of a special shape, being 15 in. in diameter at its centre and tapering upwards to a similar diameter, forming a dome intended to catch any projections given off by the filament. The lamp is 35½ in. in height and weighs 17 lb.

Electrically Heated Commutator Soldering Machine.

The P. E. CHAPMAN ELECTRICAL WORKS, 1820, Chouteau Avenue, St. Louis, Mo., announce the addition to their line of motor-building devices of an electrically-heated "Allatonce" commutator-soldering machine. It is made in various sizes and is equipped with an easily adjustable, clearly indicating, automatic temperature control. Greatly increased production is claimed for this machine by virtue of the fact that all the segments of the commutator are soldered simultaneously.

Correspondence.

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession.

Two-speed Lift Motors.

The article by Mr. R. E. Hopkins in your last issue raises an interesting question: should these lift motors be designed specially for alternating current or should the current be converted to d.c. and the more standard d.c. machine used?

There is no need to use motor generators for conversion—a valve rectifier can be used; this would not only be more silent in operation, due to the absence of moving parts, which would also make this type of conversion unit more silent in operation, but the no-load losses would be appreciably less.

Mr. Hopkins admits the superiority of the d.c. motor. Compared with his own ingenious design of the a.c. counterpart the d.c. machine would have the following advantages:—

First, it would be a standard lift motor—standard in design, construction, and installation; moreover, proved in performance. The d.c. control gear would also be simpler than the a.c., and simplicity makes for robustness. Standard designs make it easier to trace faults and effect repairs and adjustments. Moreover, standard motors would be cheaper to buy and install and less expensive in maintenance.

Secondly, the absence of magnetic hum in the d.c. machine means a quieter motor; and as journal bearings would then not be needed (for how many manufacturers would agree with the remarks of Mr. Hopkins on worm drives?) ball bearings could be used; and they are more reliable while the maintenance is not only less but negligible.

Finally, the d.c. machine offers sweeter speed variation, less jerky; in fact, a variable speed instead of an adjustable speed machine is possible, while the braking is better.

The above are a few of the arguments in favour of standard drives for standard currents, instead of non-standard designs for standard work.

Andika.

January 18th, 1931.

Cable Troubles.

I was interested to read Mr. Harmer's remarks in the discussion on Mr. L. R. Lees's paper, reported in the ELECTRICAL REVIEW of January 9th, regarding crystallisation of lead sheathing and of the porous metal used for making wiped joints. He asked why in that part of cable work they slavishly followed the plumbers, and why they did not use a hard solder. I do not think a harder solder than "plumbers' solder" is necessary for wiped joints on lead to lead or brass to lead; what is necessary is skill on the part of the jointer to make wiped joints properly; and who is more fitted for that part of cable work than the plumber? Porous metal at wiped joints is due to lack of knowledge on the jointer's part, leading to overheating and poisoning of solder before use, and overwiping. The great secret of joint-wiping is quickness, and the strength and soundness of wiped joints do not wholly depend on the form or shape of the solder around the sleeve end. The secret of soundness is not seen from the outside. If a joint is overwiped the particles of the solder are disturbed, and even when it has been properly prepared the overwiping requires more pressure on the cloth and the joint is cracked or it is so porous that the compound will percolate through the solder like a fine sieve; also, the joint is dull and chalky and is no credit to the man who made it. A bright joint with the tin showing up plainly may be depended on to stand any reasonable pressure, air or water, and cause no trouble in future.

If all jointers were taught, or were conversant with, the great art of making solder, and the metals used for that purpose (and all craftsmen should be masters of the material they work with) there would be no porous metal at sleeve ends. How many jointers can make good solder or know how? How many jointers can wash a joint, thereby eliminating any risk of porousness due to faulty first wiping? The operation of wiping a joint or a cable end, say, of 2¼ in. diameter takes, with some jointers, anything from 15 to 30 minutes and involves the use of from 7 to 10 lb. of solder, whereas a "plumber-jointer" will do the operation in a few minutes with 2¼ lb. of metal and make a better job.

William Maskery.

Manchester, *January 12th*, 1931.

Careers for Young Engineers.

With reference to the recent correspondence under this heading, I think the real point of works experience, plus an evening technical course, *versus* any other alternative, must depend entirely on the economic situation of the individual. If a potential electrical engineer can possibly afford it I would strongly advise that on leaving school he straightway takes one of the full-time day courses in electrical engineering, so that whilst his mind is still attuned to the aquisition of book learning he may qualify for the graduateship examination of the I.E.E. or some exempting diploma or degree. It is becoming more and more essential to possess this qualification before the higher situations in the industry can be aspired to, and it

is my own experience that after a lapse of years since leaving school it is almost impossible for anyone of normal ability to achieve a sufficiency of academical learning to pass this examination, however excellent his practical knowledge and experience may be.

If, on the other hand, economic conditions make it necessary for a young man to get down to the business of earning money—however small at first—nothing but real determination to succeed is going to see him through the dreary business of many evenings a week for several winter seasons spent in cold, cheerless classrooms (and they invariably are) after a hard day's work in the "shops." My advice to him all the same is to start evening classes right away and stick to them.

I cannôt agree with your correspondent "H. C. T." If a young man has had, say, three years of practical experience and evening classes combined, and he has any determination in him at all, a University course at the end of that time should be quite unnecessary. If, on the other hand, he is a waster, the greater facilities for slacking at a University would be worse than useless in moulding him for a career. "H. C. T." takes only the case of presumably monied students. My remarks regarding the good man apply equally to this class, and in the case of the monied "waster" the only hope for him is that his unearned means of subsistence be withdrawn until such time as he comes to his senses. Certainly a University would not help him.

Leslie C. Sharp.

Clapham Common, S.W. 12, *January 16th*, 1931.

Nomenclature.

With reference to the word "lead" which is so often used in the electrical trade in both its meanings, would it not be a good thing to have our standard way of spelling this word altered in the one case, leaving the spelling "lead" for the metal and changing it to "leed" for the wire or the verb "to lead." Particularly as the past tense is led, like feed and fed.

Possibly many people who continually put up with this kind of dual meaning to a word as an inflexible order of things, would welcome the discrimination.

H. Bacon.

Stafford, *January 15th*, 1931.

[The difficulty referred to is overcome in the B.E.S.A. Glossary by using "cable" instead of "lead" in one sense. Other recognised uses of the word, such as "leading-in wires" (for lamps) and "lead" in vectorial representations or in dynamo brushes, will probably cause no confusion.—EDS. ELEC. REV.]

A Note on Electrical Theory.

With reference to Mr. Starr's letter in our last issue, Mr. G. Windred asks us to state that he actually wrote "G. A. Campbell" and not "A. A. Campbell" as printed. The misreading of Mr. Windred's letter, which would not have occurred if it had been type-written, is nevertheless regretted. —EDS. ELEC. REV.

Published Specifications.

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specification will be printed and abridged, and all subsequent proceedings will be taken.

1929.

18,847. "Means for preventing telephone cables from being inductively affected by heavy-current cables parallel thereto." International General Electric Co., Inc. June 21st, 1928. (314,025.)

19,337. "Electric transformers." British Thomson-Houston Co., Ltd., F. H. Clough, C. G. Mayo, and J. G. Wellings. June 24th, 1929. (340,269.)

22,001. "Television and telekinematography process and apparatus." L. Levy. July 18th, 1928. (315,795.)

22,165. "Methods of stabilising the light emitted by a discharge-tube lamp." A. E. White (Claude Neon Lights, Inc.). July 18th, 1929. (340,203.)

22,166. "Beam beacons." A. E. White (Claude Neon Lights, Inc.). July 18th, 1929. (340,229.)

25,039. "X-ray tubes." T. H. Forde and N. W. Mellars. August 16th, 1929. (Convention date not granted.) (317,451.)

25,616/7. "Permanent magnets." Swift, Levick & Sons, Ltd., G. D. L. Horsburgh, H. S. Levick, and Darwins, Ltd. August 22nd, 1929. (340,206/7.)

25,714. "Metal-electrode arc lamps." British Thomson-Houston Co., Ltd. August 23rd, 1928. (317,832.)

26,100. "Electric switches." Etablissements E. Jaegar. September 1st, 1928. (318,253.)

27,789. "Telephone apparatus for use in aircraft or the like." Telephone Manufacturing Co. (1929), Ltd., and P. B. Healey. September 12th, 1929. (340,273.)

28,092. "Wireless receivers." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). September 14th, 1929. (340,274.)

28,103. "Electric contact establishing devices." H. T. Logan. September 16th, 1929. (340,208.)

28,179. "Electric totalisator systems." J. H. Broome. September 17th 1929. (340,298.)

28,198. "Photo-electric cells." Arcturus Radio Tube Co. September 17th, 1928. (319,216.)

28,329. "Electromagnetic driving mechanisms." J. D. Carley. September 18th, 1928. (319,774.)

28,341. "Cathode for thermionic devices and method of manufacturing the same." W. R. Bullimore. September 18th, 1929. (340,212.)

28,438. "Light-sensitive apparatus." British Thomson-Houston Co., Ltd September 19th, 1928. (319,286.)

28,453. "Electric discharge lamps with rare-gas filling." A. Lederer October 4th, 1928. (340,213.)

28,553. "Apparatus for the calibration and control of alternating-current compensation apparatus." Dr. R. Ambronn. December 5th, 1928. (340,245.)

28,605. "Electromagnetic devices for reproducing or recording sound." Electrical Research Products, Inc. December 19th, 1928. (340,219.)

28,644. "Horse and pool counting arrangements in totalisators." Ericsson Telephones, Ltd., F. Limb, and L. J. Cannell. September 21st, 1929. (340,280.

28,780. "Ignition switch devices." North & Sons, Ltd., and A. Massy-Allen. September 23rd, 1929. (340,258.)

28,802. "Remote control of broadcast-receiving apparatus." Kolster-Brandes, Ltd. October 3rd, 1928. (340,259.)

28,837. "Submarine electric signalling cables." Western Electric Co., Ltd. (Bell Telephone Laboratories, Inc.). September 23rd, 1929. (340,261.)

28,990. "Electrical frequency-changing apparatus." Electrical Research Products, Inc. October 4th, 1928. (Addition to 312,338.) (340,286.)

29,027. "Carrier-current telegraph system." Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). September 25th, 1929. (340,301.)

29,029. "Dielectric material." Standard Telephones and Cables, Ltd., and L. E. Salas. September 25th, 1929. (340,302.)

29,030. "Electric cables." Standard Telephones and Cables, Ltd., and T. R. Scott. September 25th, 1929. (Cognate application, 56/30.) (340,303.)

29,100. "Telephone or like systems." Automatic Telephone Manufacturing Co., Ltd., and A. E. Caswell. September 25th, 1929. (340,308.)

29,120. "Electrical heating elements." Wright, Bindley & Gell, Ltd., and H. Wintle. September 26th, 1929. (340,309.)

29,338. "Electric lamps adapted for optical projection purposes, and method of manufacturing the same." British Thomson-Houston Co., Ltd. September 27th, 1928. (319,748.)

29,380. "Electrical correction, shaping, and like circuit arrangements." N. H. Clough, Marconi's Wireless Telegraph Co., Ltd., and Gramophone Co., Ltd. September 27th, 1929. (340,317.)

30,622. "Electrically-driven automobile vehicles." Tatra-Werke, Automobil- und Waggonbau Akt. Ges. December 31st, 1928. (340,348.)

32,412. "Electric domestic hot-water supply heaters." Rycroft & Co., Ltd., and C. S. Howroyd. April 8th, 1930. (340,363.)

32,613. "Television-receiving systems." Gramophone Co., Ltd., and M. Bowman-Manifold. October 26th, 1929. (340,356.)

33,377. "Method for exciting transverse and torsional vibrations in piezo electric crystals." E. Giebe and Dr. A. Scheibe. November 3rd, 1928. (340,361.)

33,843. "Electric conductor coupling constituted by a plug and socket" Siemens-Schuckertwerke Akt. Ges. April 8th, 1929. (340,363.)

33,869. "Electro-optical devices and processes for the manufacture thereof." Allgemeine Elektricitäts Ges. November 6th, 1928. (340,364.)

34,413. "Electric insulators." Corning Glass Works. November 24th, 1928. (340,371.)

34,812. "Loud speakers and similar apparatus." G. T. Allen. November 14th, 1929. (340,374.)

35,567. "Totalisator counting and displaying arrangements." Ericsson Telephones, Ltd., and F. Limb. September 21st, 1929. (Divided application on 28,644/29.) (340,288.)

35,568. "Switching arrangements for entering bets in totalisators." Ericsson Telephones, Ltd., and F. Limb. September 21st, 1929. (Divided application on 28,644/29.) (340,289.)

35,653. "Automatic electric alarm systems." A. H. McNeil and Associated Fire Alarms, Ltd. November 21st, 1929. (340,383.)

36,918. "Wireless receivers." Gramophone Co., Ltd., and W. J. Brown. December 2nd, 1929. (340,389.)

37,427. "Attachment for adjusting the height of electric lamps." W. A. Davies. December 6th, 1929. (340,395.)

37,580. "Vacuum tubes, particularly for use in radio sets." Arcturus Radio Tube Co. December 7th, 1928. (340,396.)

37,696. "Microphones." Coventry Automatic Telephones, Ltd., and J. A. Tweats. December 9th, 1929. (340,398.)

37,735. "Thermionic valve circuits." O. D. Lucas. December 9th, 1929. (Cognate applications, 143/30 and 2,933/30.) (340,399.)

37,851. "Commutators for dynamo-electric machines." A. Worner. December 10th, 1929. (340,401.)

38,604. "Electrically-driven vehicles." S. S. Guy and W. A. Stevens. December 17th, 1929. (340,405.)

39,070. "Dynamo-electric machines." G. A. Juhlin and Associated Electrical Industries, Ltd. December 20th, 1929. (340,407.)

39,258. "Electrically-driven floor-treating apparatus." Electrolux, Ltd. December 24th, 1928. (340,408.)

1930.

1,453. "Devices for controlling the polarity of electric circuits subject to reversal." British Thomson-Houston Co., Ltd. January 18th, 1929. (340,418.)

2,557. "Joints for electric cables." W. T. Henley's Telegraph Works Co., Ltd., and E. Moor. January 24th, 1930. (340,426.)

3,068. "Material for making an electrolyte for primary batteries." A. Schmid and Metropole Developments, Ltd. January 29th, 1930. (340,429.)

3,324. "Electric fusible devices." English Clock and Watch Manufacturers, Ltd., H. N. Walford, and H. D. Lucas. January 31st, 1930. (340,430.)

3,655. "Methods of manufacturing electrical resistances." H. A. Gil (Steatit-Magnesia Akt. Ges.). February 3rd, 1930. (340,433.)

6,662. "Distributive joints or terminals of multiple-conductor electric cables." W. W. Triggs (Ohio Brass Co.). February 28th, 1930. (340,448.)

8,161. "Apparatus for obtaining light metals by electrolysis." Soc. of Chemical Industry in Basle. August 29th, 1929. (340,451.)

10,485. "Detection of high-frequency oscillations." British Thomson-Houston Co., Ltd. April 19th, 1929. (340,456.)

10,686. "Electromagnetic sound warning apparatus." M. M. L. Gentil-homme (née Bordey). October 19th, 1929. (340,457.)

16,313. "Electrical power systems for rolling mills and the like." Associated Electrical Industries, Ltd. May 27th, 1929. (340,467.)

26,963. "Electric upsetting apparatus." G. Benedetto. September 20th, 1929. (Divided application on 28,517/29.) (340,290.)

27,200. "Electric upsetting apparatus." G. Benedetto. September 20th, 1929. (Divided application on 340,215.) (340,224.)

28,169. "Electrical resistances." A. L. Puch, Jun. June 20th, 1929. (Divided application on 19,009/29.) (340,264.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 14th :—

Novotext. No. 508,662. Class 6. Parts of machines made of a fibrous material in combination with artificial resin as a binding agent.—Allgemeine Elektricitäts Gesellschaft, Berlin. (British representatives: Edward Evans and Co., 27, Chancery Lane, W.C.2.)

Jiffy. No. 515,754. Class 6. Vacuum cleaning machines.—W. F. Harkness, 2, Rugby Mansions, Addison Bridge, W.14.

Mastavac (lettering and design). No. 517,873. Class 6. Electric vacuum cleaning machines and carpet cleaning machines.—A. W. Dryer, trading as A. W. Driver & Son, 84-86, Chancery Lane, W.C.2.

Lighthouse (lettering and design). No. 517,046. Class 13. Pocket lamp cases and electric torches.—Bock & Dundas Fox, Ltd., 11, Farringdon Avenue, E.C.4.

Briticent. No. 517,217. Class 13. Electric lighting, heating, and power fittings.—British Central Electrical Co., Ltd., 6-8, Rosebery Avenue, E.C.1.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ABERDEEN.—Alterations and improvements, Caledonian Hotel, Union Terrace; manager.

ASCOT.—Mansion for F. C. Minoprio; Norris & Co., Ltd., builders, Sunningdale.

AYRSHIRE.—Municipal buildings and pavilion (electric lighting) for Troon T.C.; burgh surveyor.

BAKEWELL.—Waterworks; surveyor to U.D.C.

BATLEY.—Houses (166) for the T.C.; borough surveyor.

BEACONSFIELD.—Houses (124) for the U.D.C.; J. H. Crosby, surveyor.

BEDFORD.—Houses (62) for the R.D.C.; surveyor.

BLACKPOOL.—Schools, Norbreck, and Highfield Road; Dr. Ikin, director of education. Catholic church, Marton, for Canon Lupton, of St. Cuthbert's; R. B. Mather, architect, Birley Street.

BOURNEMOUTH.—Houses (400) during the next five years for the T.C.; borough surveyor.

BRADFORD.—Alterations to Empress Picture House; licensees.

BRENTFORD.—Church, Gunnersbury Lane; T. H. B. Scott, architect.

BURY.—Flats (200) at Springs; borough engineer, Bank Street.

BUTE.—Reconstruction of public dance hall for Rothesay T.C.; G. J. McNair, achitect, Glasgow.

CARLISLE.—Municipal offices and shops, prison site; borough engineer.

CHESHIRE.—School, Poynton (£30,000), for the county E.C.; director of education, Chester.

CHESTERFIELD.—Town hall and municipal offices, Rose Hill estate; borough engineer.

COLCHESTER.—Aerodrome; borough engineer.

CONGLETON.—Houses (75) for the R.D.C.; surveyor.

COVENTRY.—Houses, Whitley (50), for the T.C.; borough surveyor.

CREWE.—Houses (350) during the next five years for the T.C.; borough surveyor.

DORCHESTER.—Oil depôt; Anglo-American Oil Co., Ltd. School, Shaftesbury, for the county E.C.; Broad and Dockerill, architects, Lloyd's Bank Chambers, Lansdowne, Bournemouth.

DUDLEY.—School, Netherton, for the borough E.C.; J. Whaley, director of education.

DURHAM.—School, Spennymoor, for the E.C.; F. Willey, architect, 34, Old Elvet.

EDINBURGH.—Alterations, Royal Scottish Museum and Scottish National Portrait Gallery (£18,000); the curator.

FELLING.—Houses (752) for the T.C.

FIFESHIRE.—Houses (80), Kelty, for the C.C.; H. F. Hodge, Commercial Bank Buildings, High Street, Dunfermline. Offices, Cowdenbeath, for Fife Coal Co.; the manager. Mining school, Cowdenbeath (£15,000); the clerk, Education Committee, Cupar.

GLOUCESTER.—Houses (300) for the T.C.; city surveyor.

HEMEL HEMPSTEAD.—Factory; Landon's Granulated Fertiliser Co., Ltd., Jubilee Road, Watford.

ILKESTON.—Sewage disposal works (£57,000); Wilcox and Raikes, engineers.

IRISH FREE STATE (DUBLIN).—Conversion of Charlemont House to museum for the Corporation; city architect, Exchange Buildings, Lord Edward Street.

LIVERPOOL.—School (1,800 places), Norris Green, for the E.C.

LONDON (ILFORD, E.).—Isolation hospital extensions (£39,761) for the T.C.; borough surveyor.

(EALING, W.).—School on Grange site for T.C. (£15,500); G. F. Taylor, contractor.

(WEST HAM, E.).—Fire station, Custom House, for the T.C.; borough engineer.

(PADDINGTON, W.).—Enlargement of Palace Cinema, Kensal Rise; J. Stanley Beard & Clare, architects.

LUTON.—Houses (168) for the T.C.; borough surveyor.

MANCHESTER.—Branch library, Wilbraham estate; city architect, Town Hall.

MANSFIELD.—Houses (500) for the T.C.; borough surveyor.

NEWBURY.—Water-pumping station for the T.C.; W. H. D. Lester, consulting engineer, 18, Cheap Street.

OXFORD.—House clearance schemes; city surveyor. Houses (82), Towns Road; N. Moss & Son. Additions, Botley Road, for Oxford Ice Skating Rink Co., Ltd. Offices, Garsington Road, Cowley; Pressed Steel Co. of Great Britain, Ltd.

PLYMOUTH.—Aerodrome; borough engineer. Offices, Princess Square; Phœnix Assurance Co., Ltd.

PRESTON.—Senior school, Frenchwood; W. Platt, borough engineer.

ROTHERHAM.—Conversion of Masbro Street Chapel to dance hall; Mr. Grayson. Extensions, printing works, Henry Street; H. Garnett & Co., Ltd.

RUGBY.—Houses (200) for the U.D.C.; surveyor.

ST. ALBANS.—Houses (250) for the T.C.; city surveyor. School (320 places) for the Church of England managers; W. H Randall, secretary.

ST. HELENS.—School, Grange Park, and extensions, Parr school (£13,460), for the borough E.C.; education architect.

SAFFRON WALDEN.—Waterworks (£20,000); borough engineer.

SALE.—Sewage disposal works; surveyor to U.D.C.

SEDGLEY.—Extensions, Dibdale Works; Gibbons (Dudley), Ltd.

SIDMOUTH.—Houses (90) for the U.D.C.; C. P. Unwin, builder, Macclesfield.

SOMERSET.—School, Clevedon (£20,000), for the county E.C.; Burston & Hawkins, builders.

SWANSEA.—Junior school, Baptist Wells; E. E. Morgan, borough architect.

TADCASTER.—Houses (128) for the R.D.C.; surveyor.

THORNTON HEATH.—Re-erection of Beulah Works, Ladbrook Road, for Uno Products, Ltd. (£10,000).

TONBRIDGE.—Electric lighting installation, Capel Isolation Hospital, for the R.D.C.; clerk.

TORQUAY.—Senior school, Hele, for the E.C.

WAKEFIELD.—Sewage works; John Haworth, consulting engineer.

WARE.—Houses (120) for the R.D.C.; surveyor.

WATFORD.—Houses (600) during the next five years for the T.C.; borough surveyor.

WEDNESBURY.—Houses (200) for the T.C.; borough surveyor.

WHICKHAM (DURHAM).—Houses (500) for the U.D.C.

WIDNES.—Houses (612) for the T.C.; borough surveyor.

WIGAN.—Houses (1,168) during the next five years for the T.C.; W. F. Gardner, borough engineer.

WILTSHIRE.—Senior schools, Chippenham (320 places) for the county E.C.; director of education, Trowbridge. Secondary school, Trowbridge; W. E. Chivers & Son, Ltd., builders, Devizes. Police station, Chippenham, for the C.C.; county architect, Trowbridge.

WOLSTANTON.—Senior school (£17,977) for the E.C.; S. Heath & Son, Ltd., builders.

WOLVERHAMPTON.—Baths and wash-houses (£38,000); borough engineer.